

Figure 2.1-1
Portland Harbor RI/FS
Remedial Investigation Report
Number of Observations of Radio-Tagged Chinook Salmon in
Shallow Water and Deep Water Habitats between RM 3.5 and 11.7

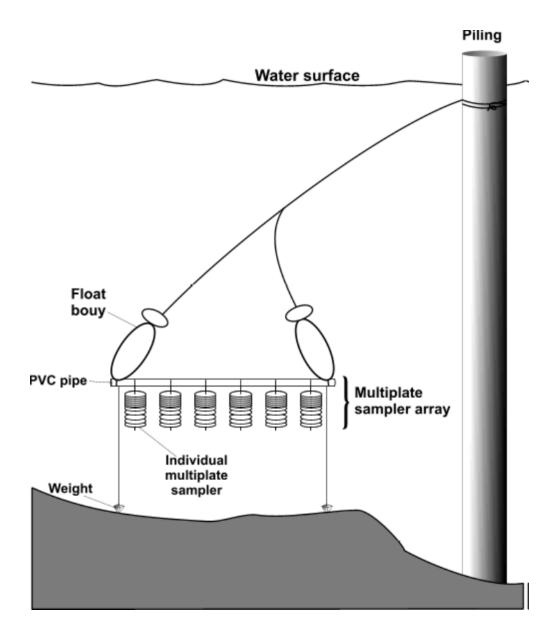


Figure 2.1-2
Portland Harbor RI/FS
Remedial Investigation Report
Multiplate Sampler Array

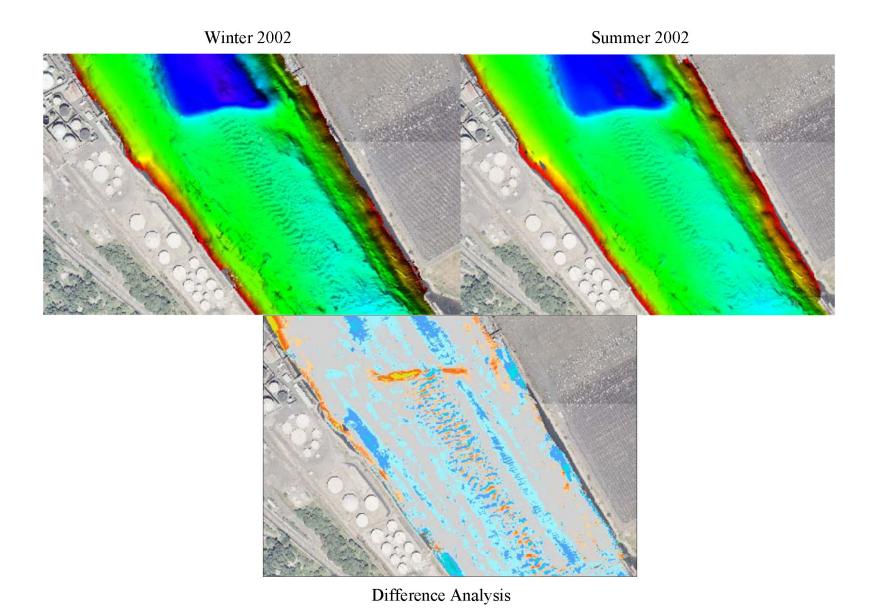
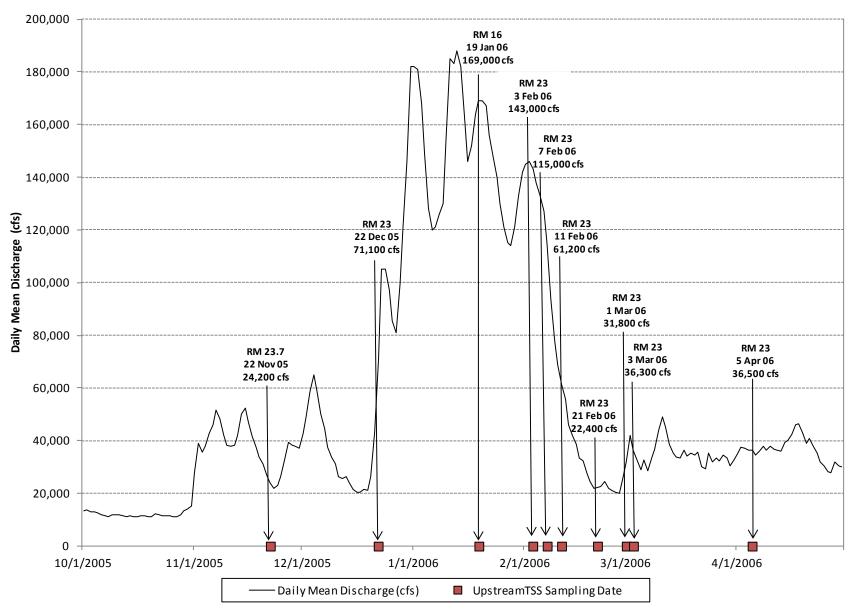


Figure 2.1-3
Portland Harbor RI/FS
Remedial Investigation Report
Example of Winter and Summer 2002 Sun-Illuminated
Images and Difference Analysis (DEA 2003a)



Note: Daily mean discharge values shown were downloaded from the USGS Real Time National Water Information System (NWIS) Database for the Morrison Bridge station 14211720 on March 6, 2009. Discharge values shown for October 1-31, December 16, February 24-27, and April 1-3 are estimated.

Figure 2.1-4
Portland Harbor RI/FS
Remedial Investigation Report
Upstream TSS Study Period Hydrograph and Sampling Dates

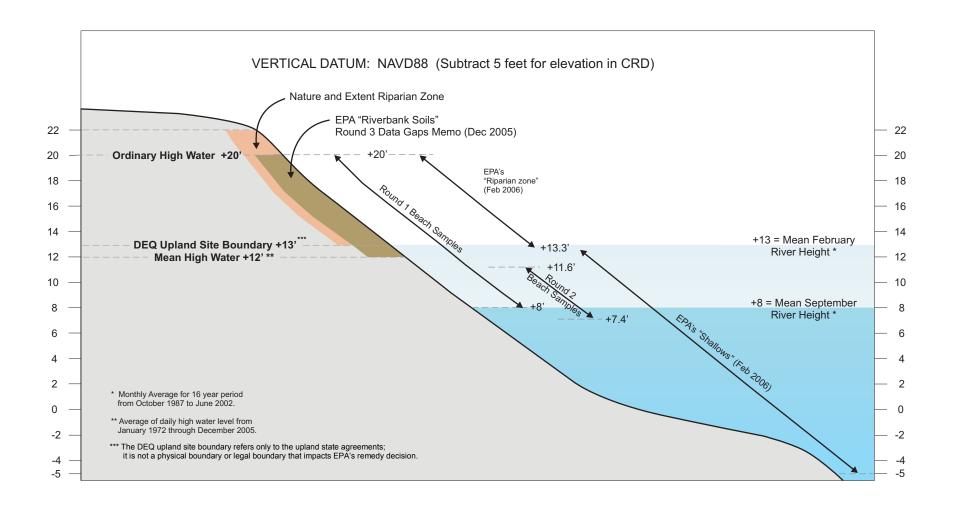
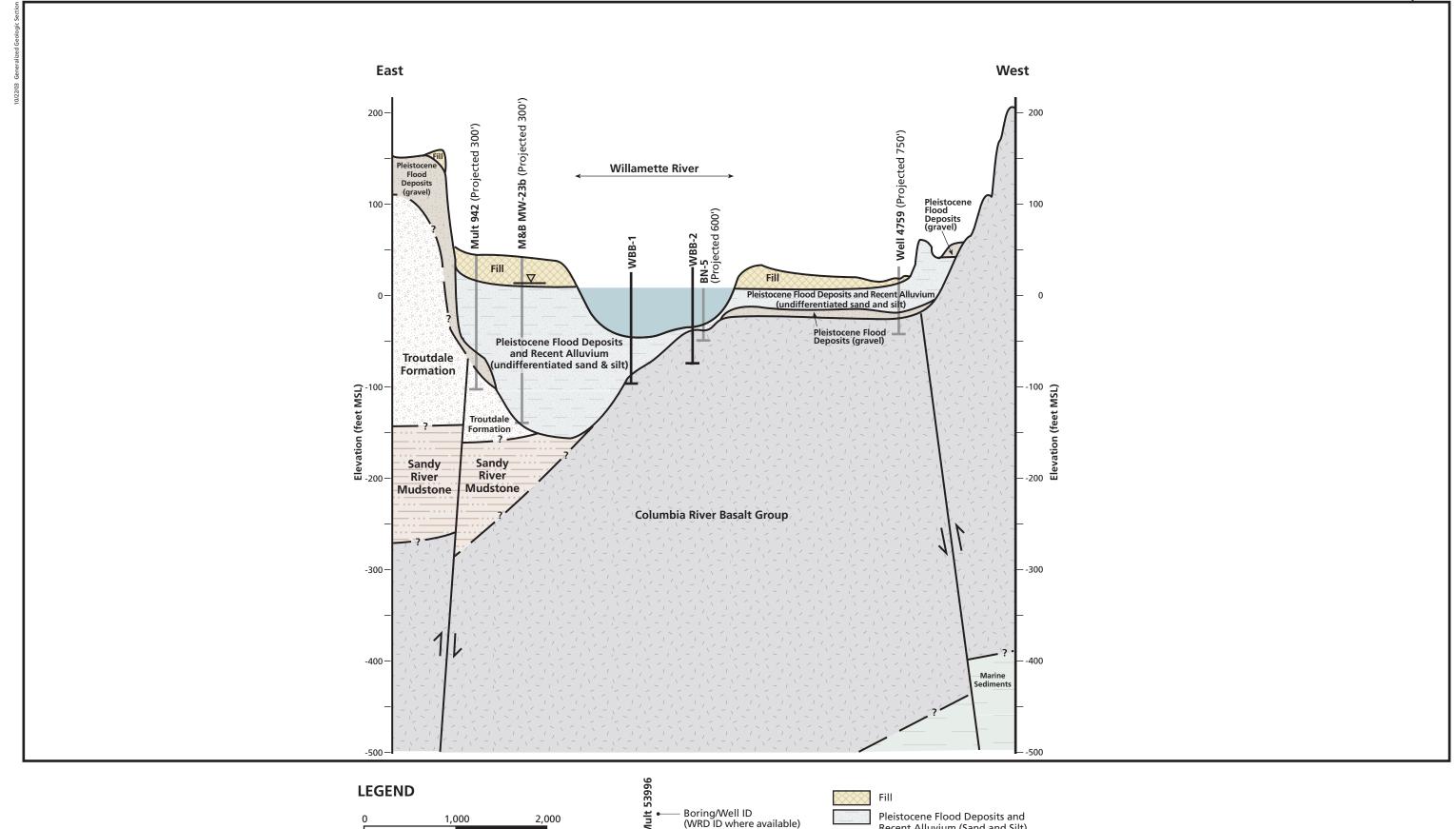


Figure 2.2-1

Portland Harbor RI/FS
Remedial Investigation Report
Schematic Willamette Riverbank
Cross Section, RM 2-11



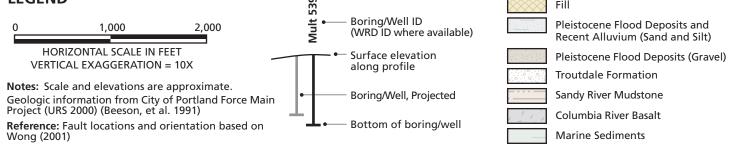
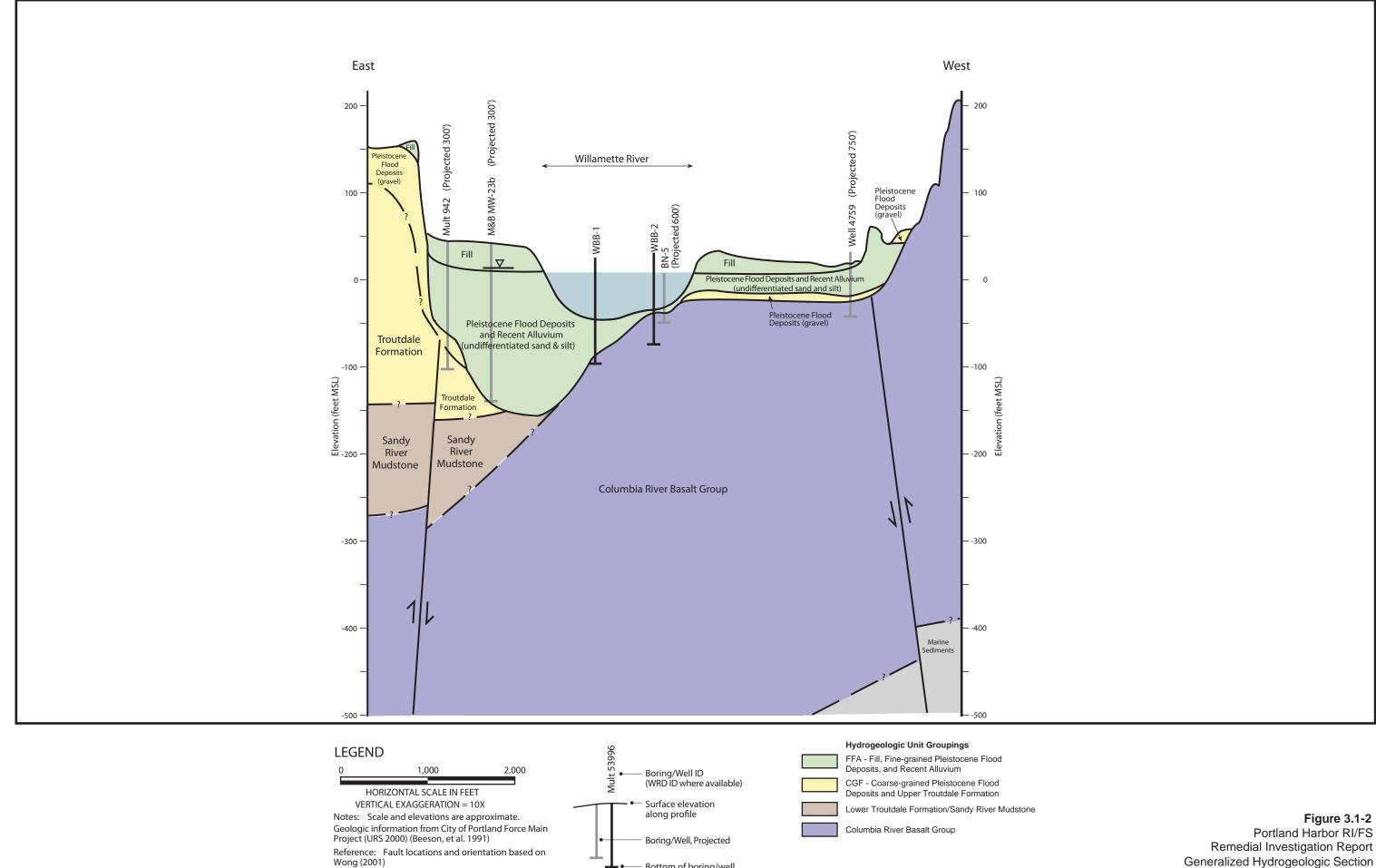


Figure 3.1-1
Portland Harbor RI/FS
Remedial Investigation Report
Generalized Geologic Section



Bottom of boring/well

Adapted from Figure 3.1-1 prepared by Groundwater Solutions Inc.

Generalized Hydrogeologic Section

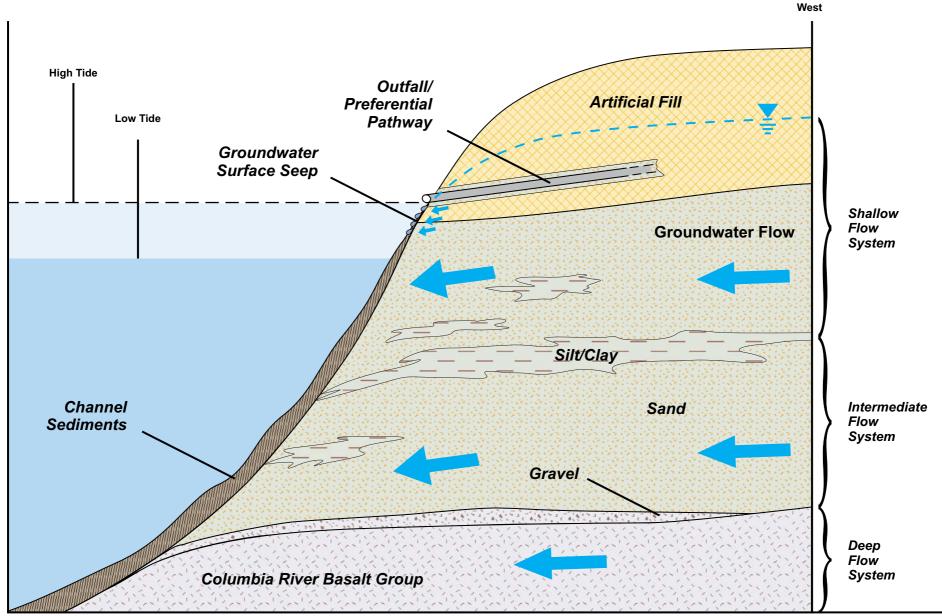


Figure 3.1-3
Portland Harbor RI/FS
Remedial Investigation Report
Conceptual Model of Groundwater Flow

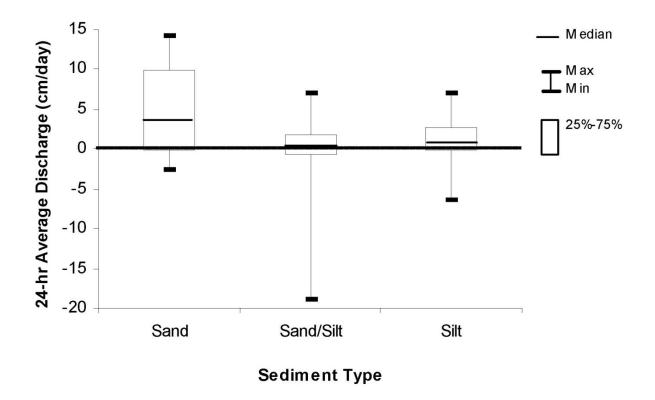
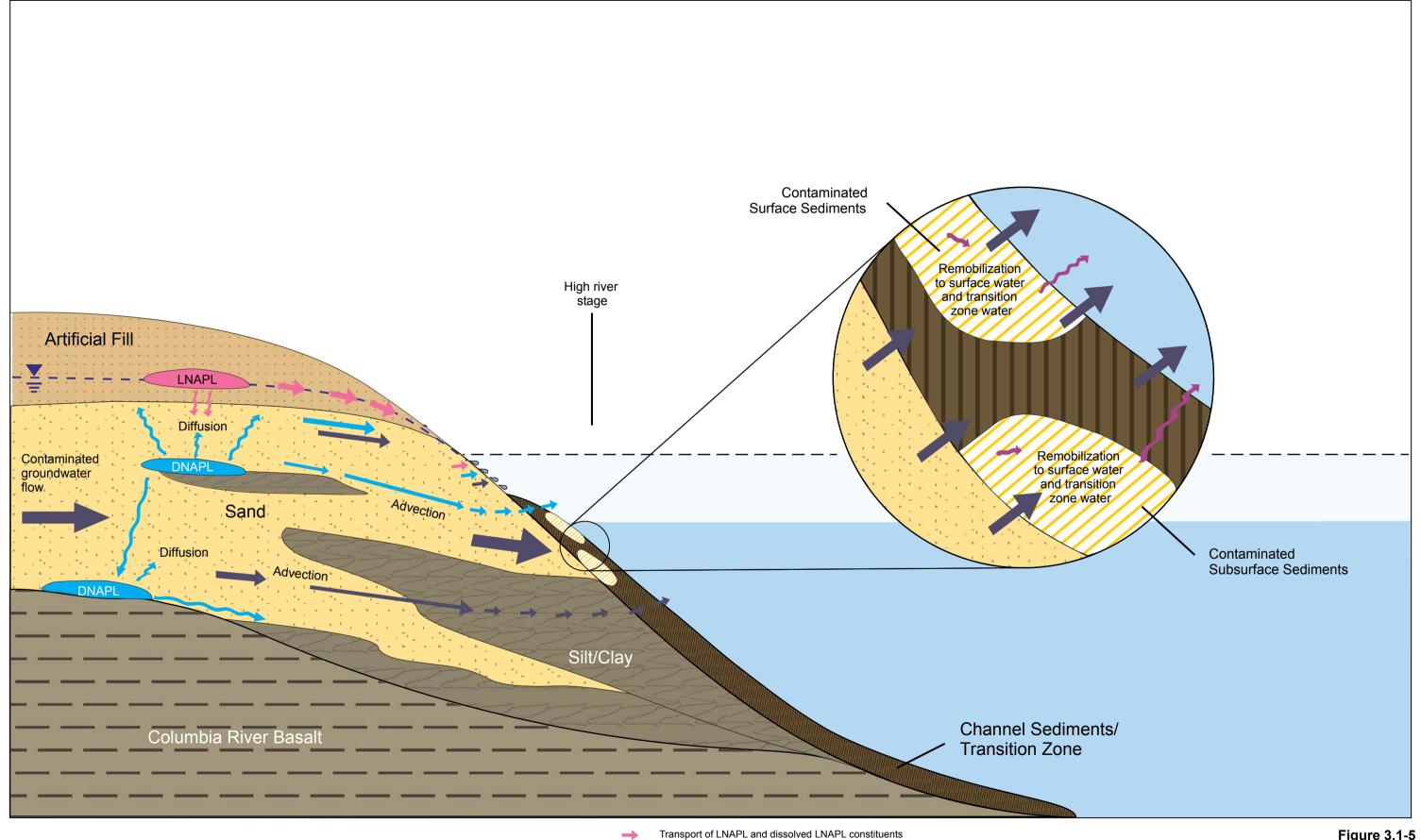


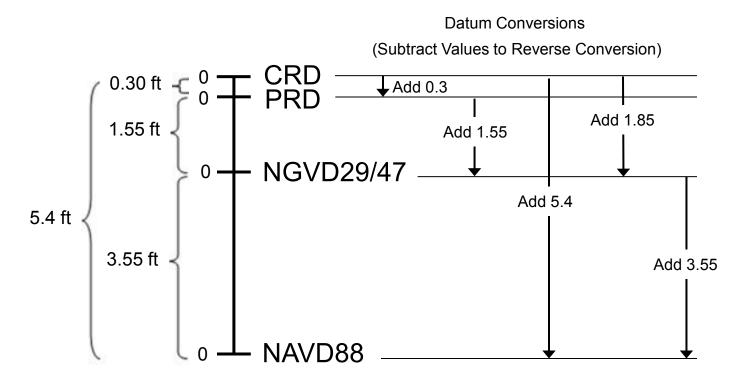
Figure 3.1-4
Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plot of Seepage Meter Results



Transport of DNAPL

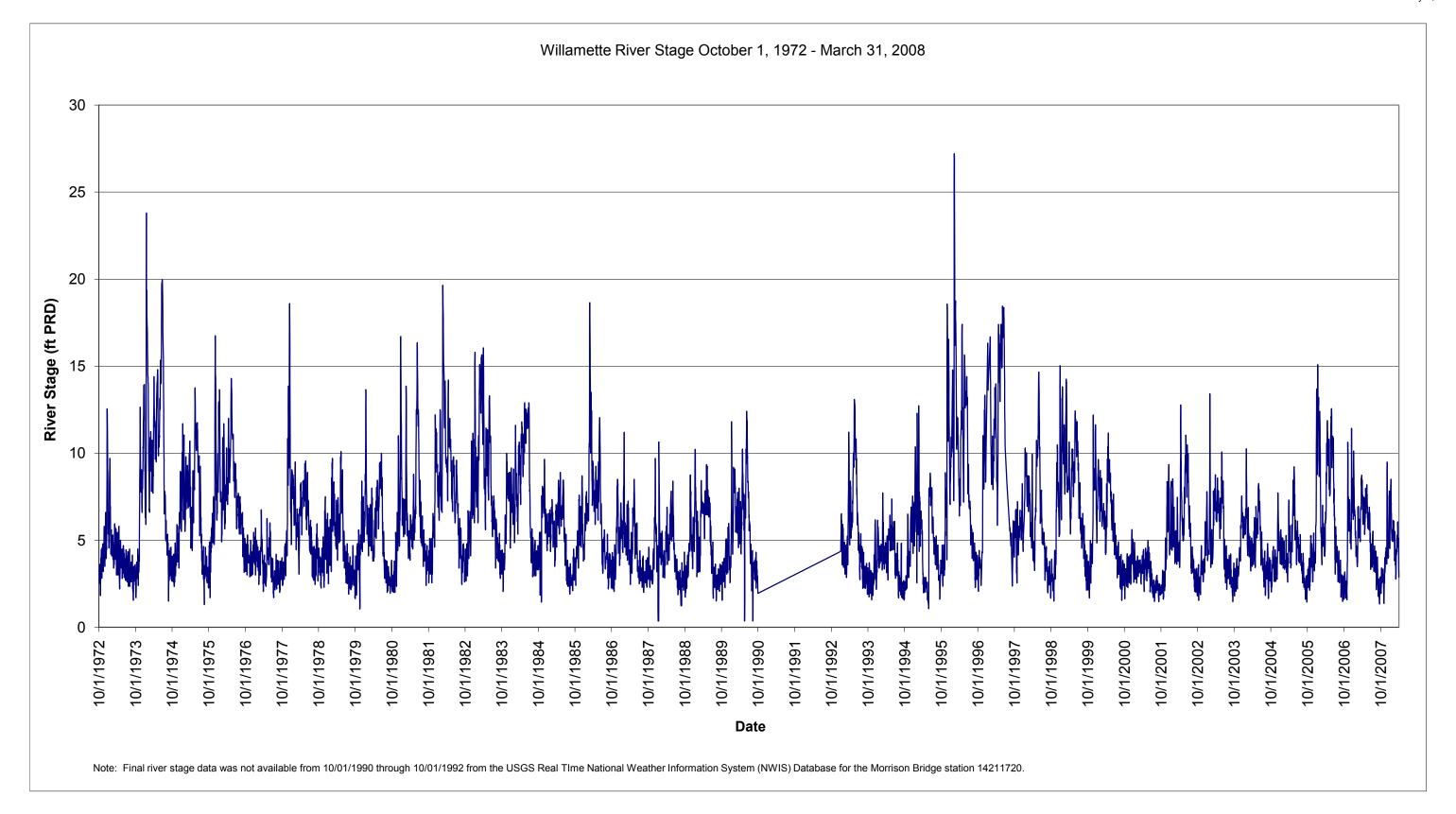
Groundwater flow paths

Figure 3.1-5 Portland Harbor RI/FS Remedial Investigation Report Physical Conceptual Model of Transport Processes to the River



Relative Height of Datums (at RM 12.8, not to scale)

Figure 3.1-6
Portland Harbor RI/FS
Remedial Investigation Report
Datum Relationship for Portland Harbor



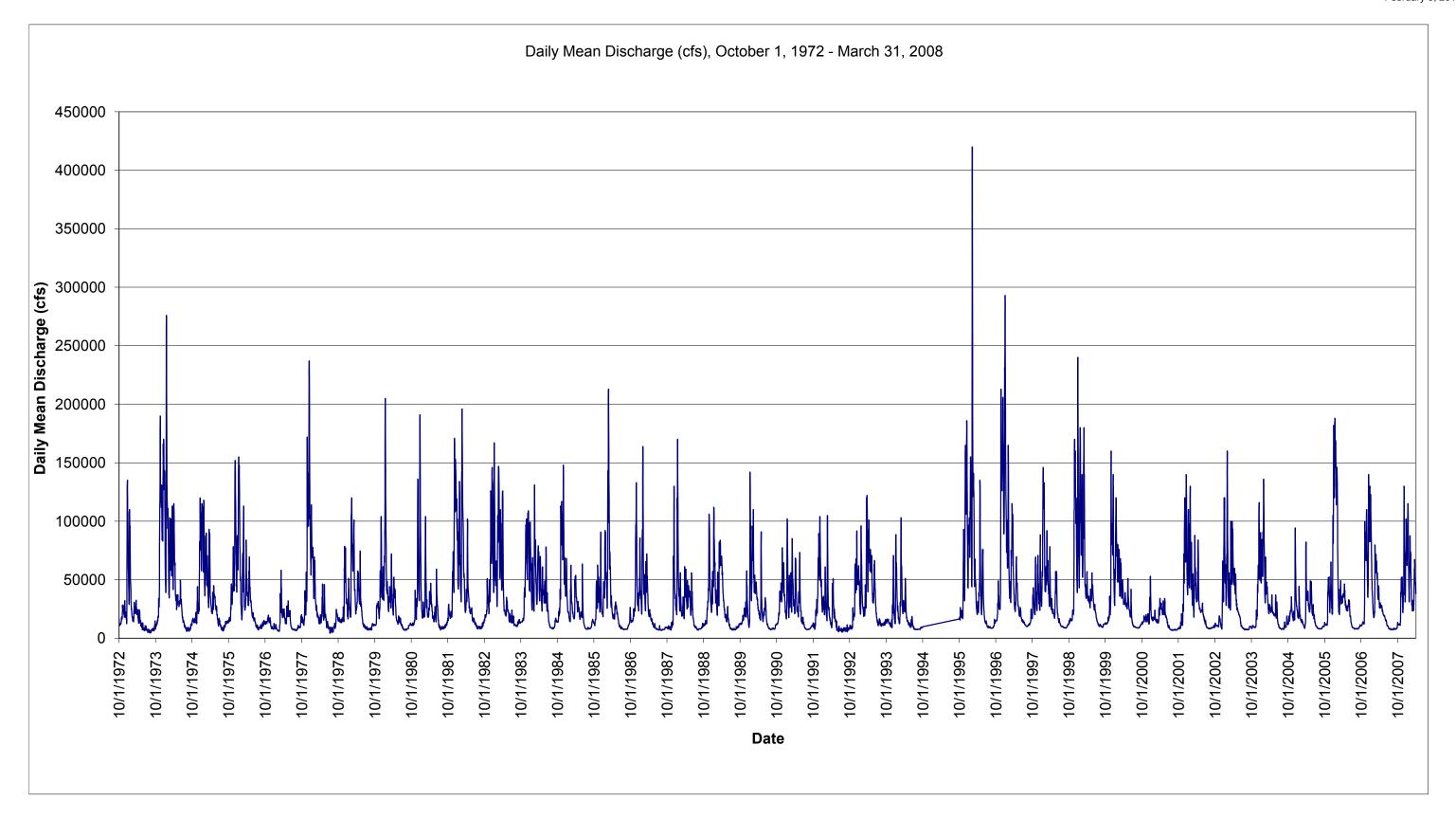


Figure 3.1-8
Portland Harbor RI/FS
Remedial Investigation Report
Daily Mean Discharge (cfs),
October 1, 1972 through March 31, 2008

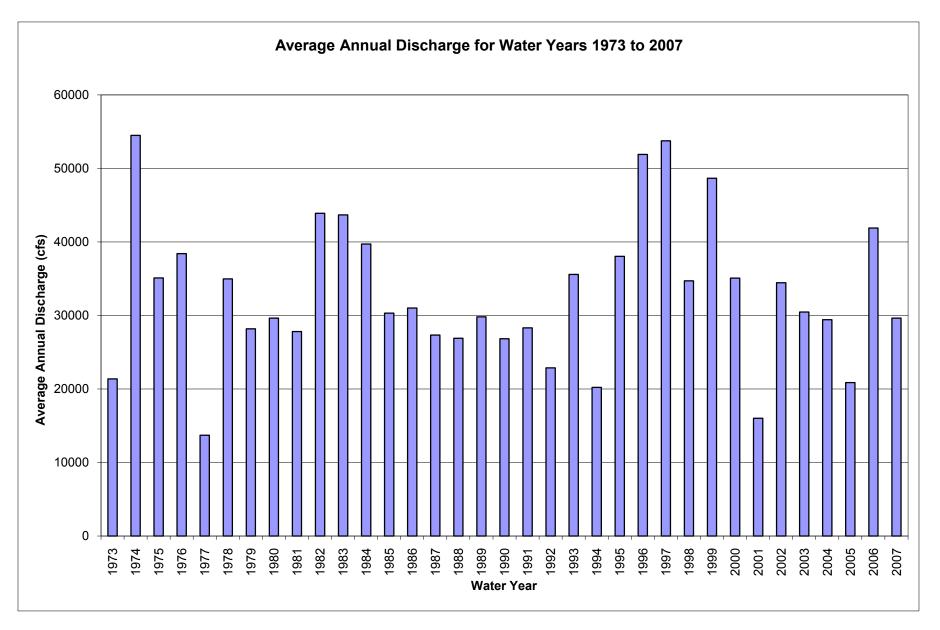


Figure 3.1-9
Portland Harbor RI/FS
Remedial Investigation Report
Average Annual Discharge for
Water Years 1973 to 2007

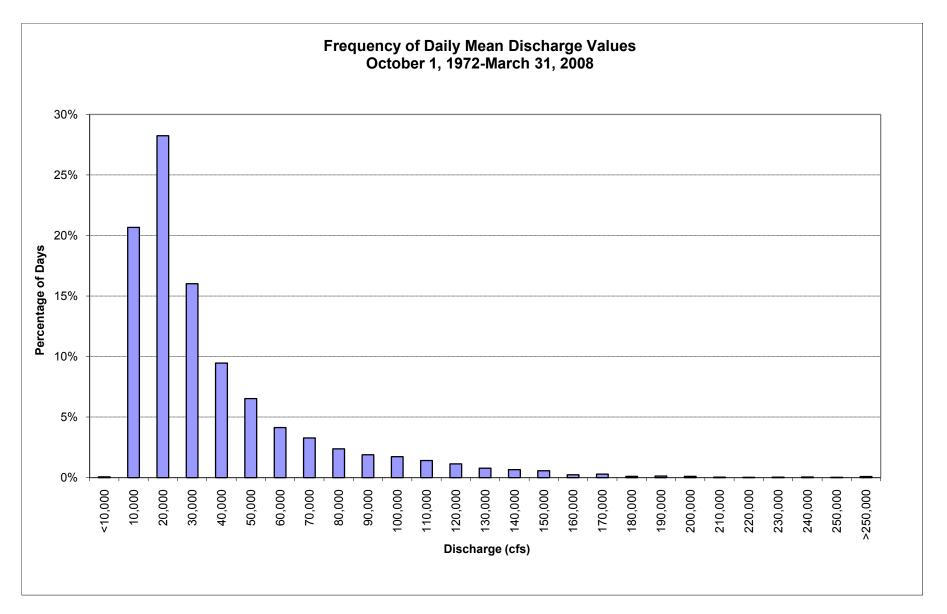


Figure 3.1-10
Portland Harbor RI/FS
Remedial Investigation Report
Frequency of Daily Mean Discharge Values,
October 1, 1972 - March 31, 2008

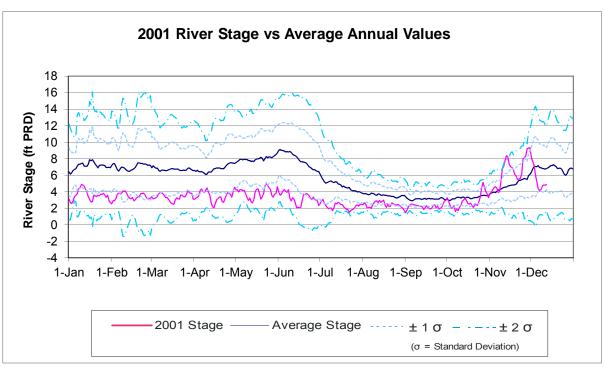


Figure 3.1-11a 2001 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

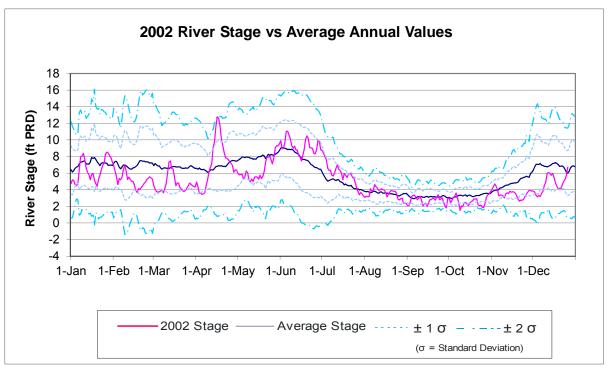


Figure 3.1-11b 2002 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

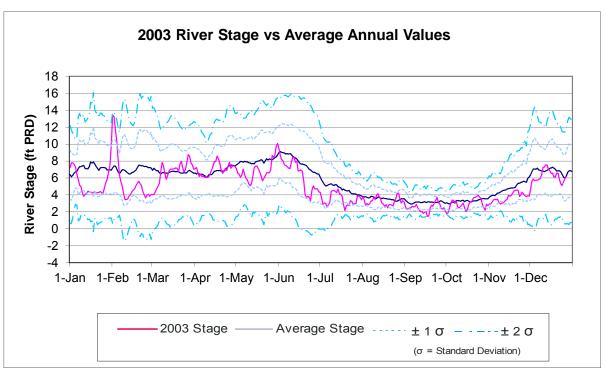


Figure 3.1-11c 2003 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

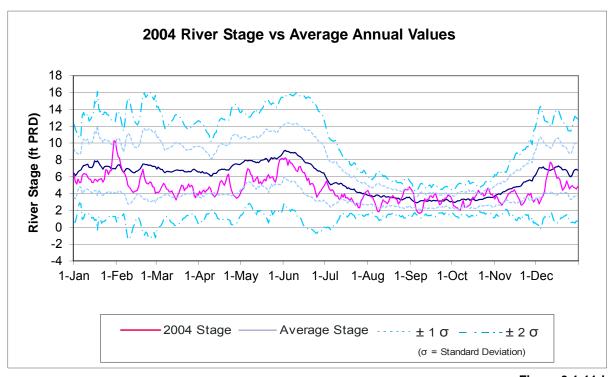


Figure 3.1-11d 2004 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

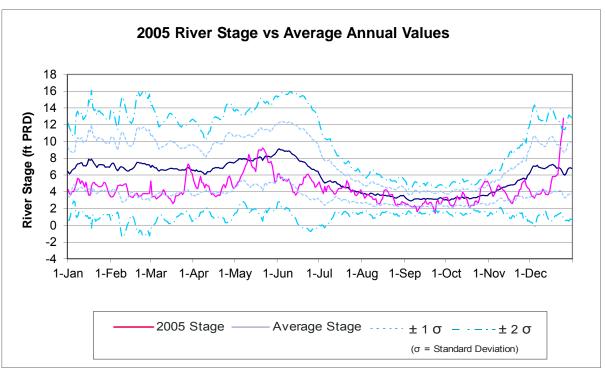


Figure 3.1-11e 2005 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

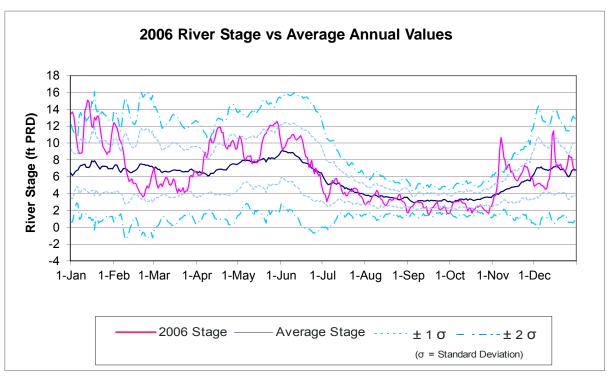


Figure 3.1-11f 2006 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

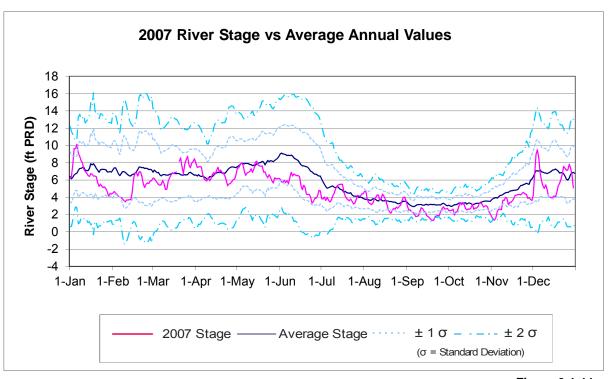


Figure 3.1-11g 2007 Willamette River Stage Data Versus Average Annual Values (October 1972 – March 2008)

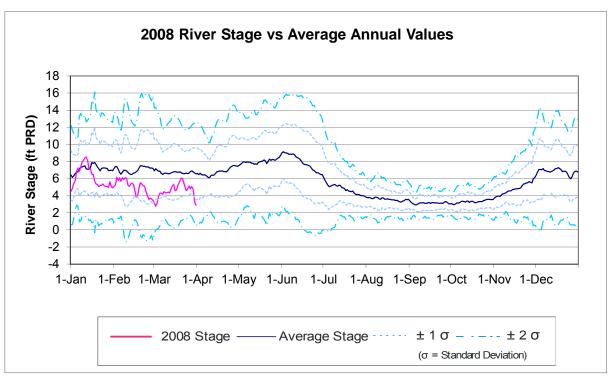


Figure 3.1-11h
2008 Willamette River Stage Data Versus
Average Annual Values (October 1972 – March 2008)

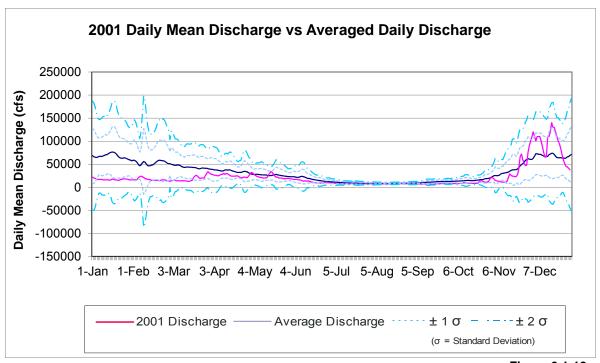


Figure 3.1-12a 2001 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

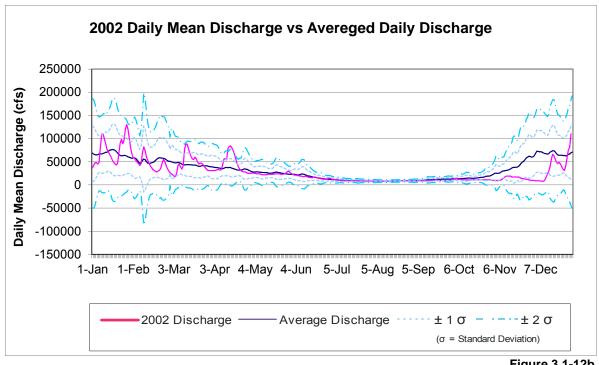


Figure 3.1-12b 2002 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

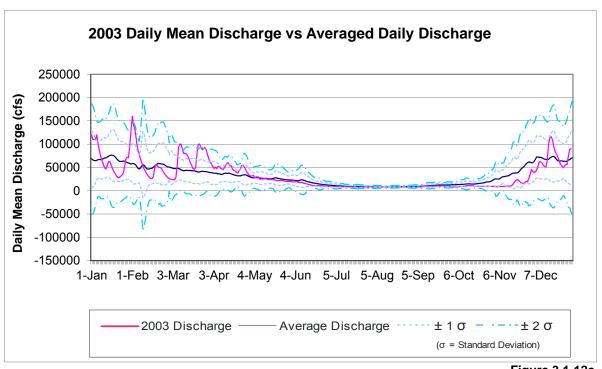


Figure 3.1-12c 2003 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

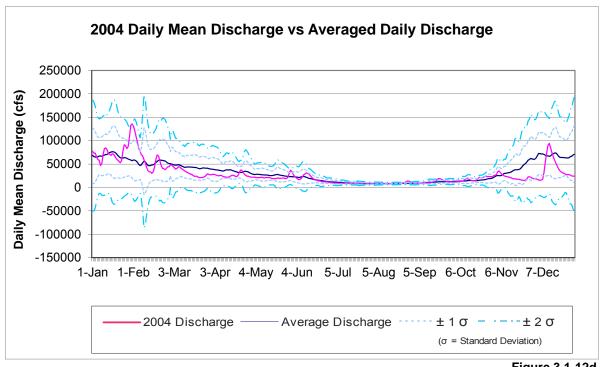


Figure 3.1-12d 2004 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

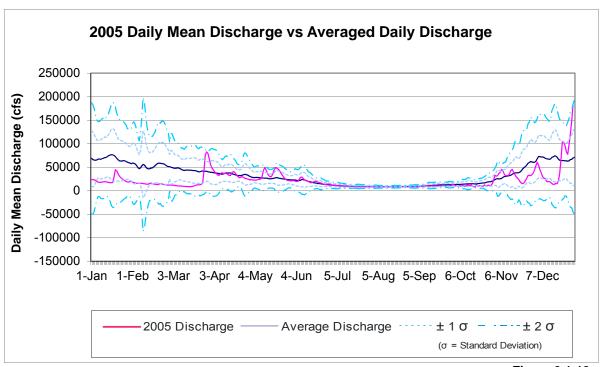


Figure 3.1-12e 2005 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

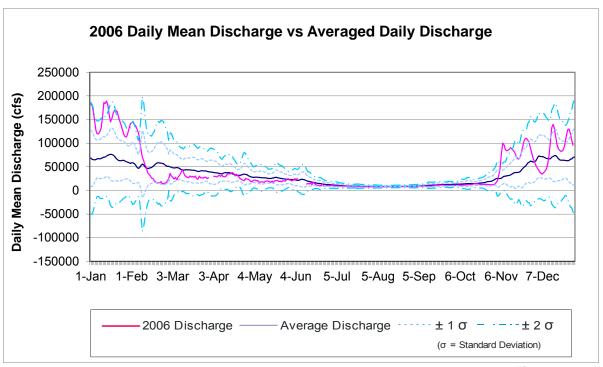


Figure 3.1-12f 2006 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

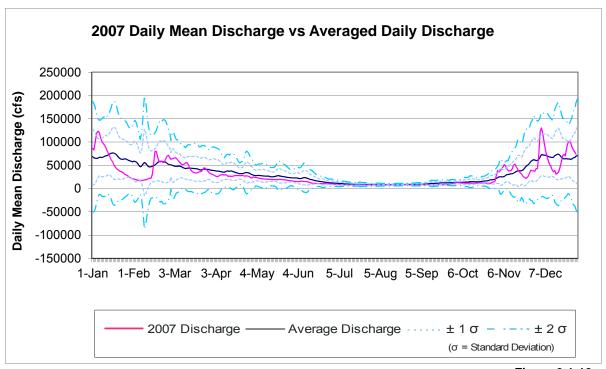


Figure 3.1-12g 2007 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)

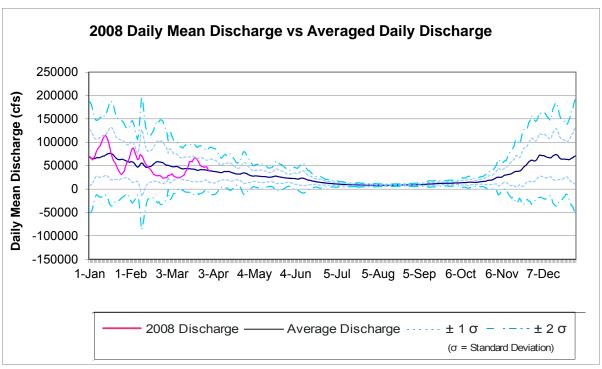
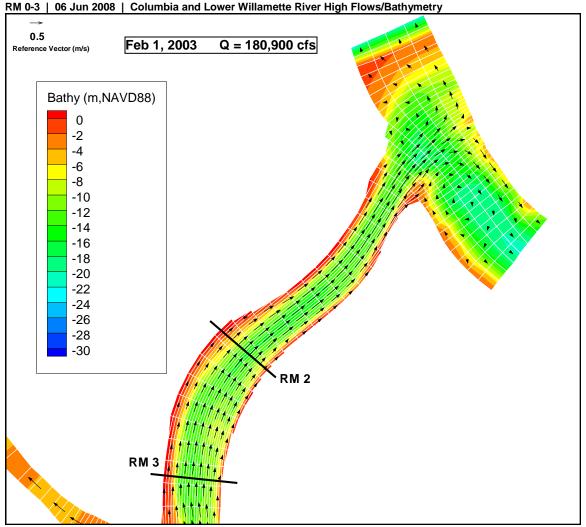


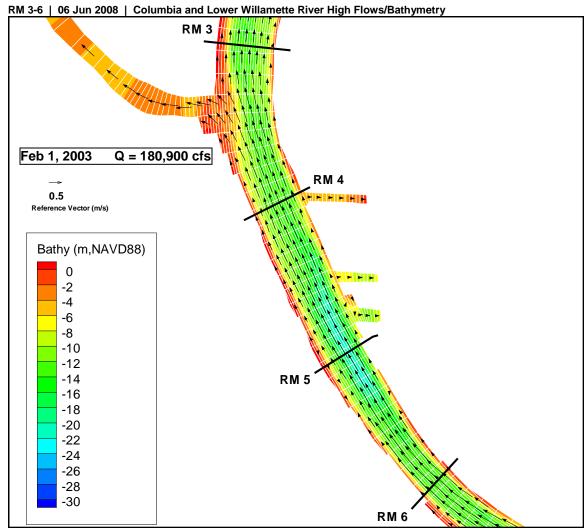
Figure 3.1-12h 2008 Willamette River Daily Mean Discharge Versus Averaged Daily Discharge (October 1972 – March 2008)



Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

Figure 3.1-13a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 0–3

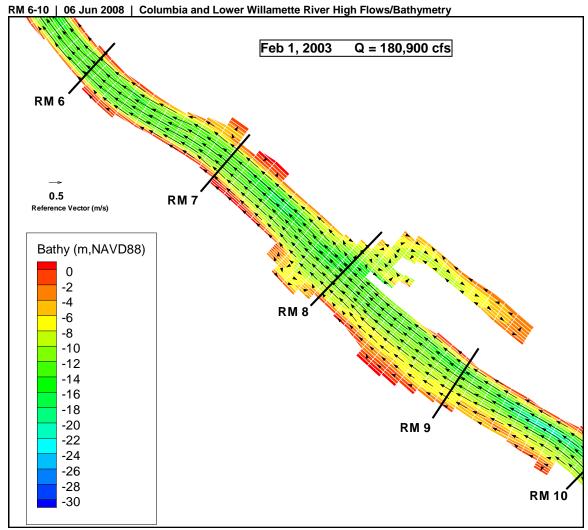


Bathymetric data collected in Feb 2004. Additional Notes:

Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs
Lower Columbia River conditions; stage at Vancouver: 5.4 m NAVD88, stage at St. Helens: 4.8 m NAVD88; river flow 170,000 cfs.

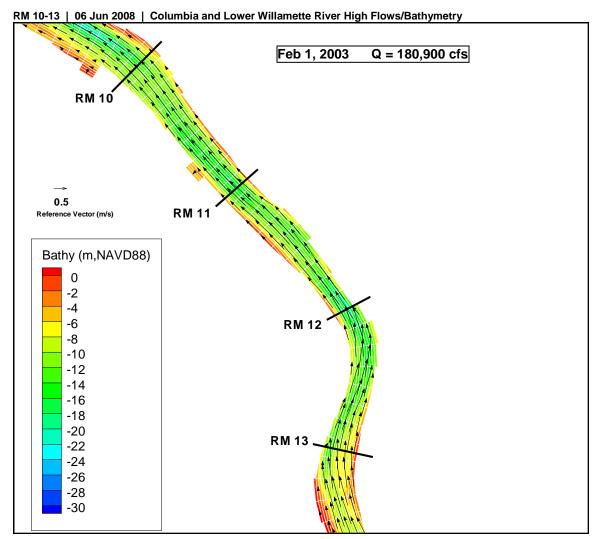
Figure 3.1-13b Portland Harbor RI/FS Remedial Investigation Report Vector Velocity Plot, High Flow RM 3-6



Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

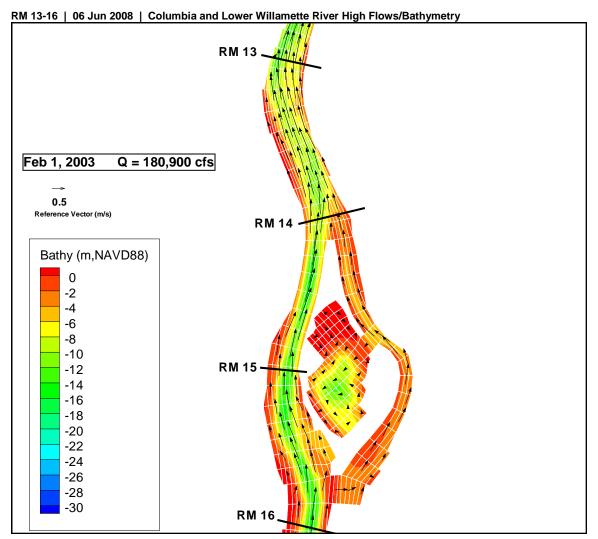
Figure 3.1-13c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 6–10



Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

Figure 3.1-13d
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 10–13



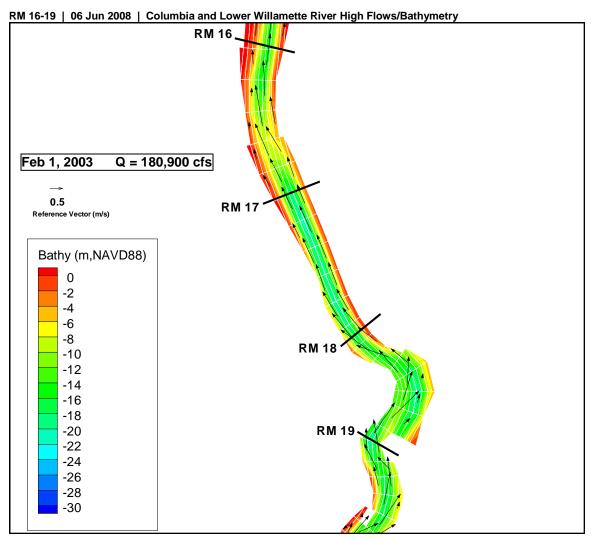
Additional Notes:

Bathymetric data collected in Feb 2004.

Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

Figure 3.1-13e
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 13–16



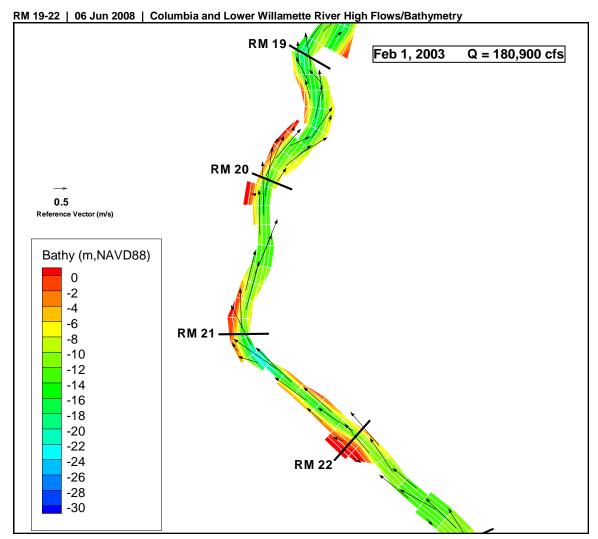
Additional Notes:

Bathymetric data collected in Feb 2004.

Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs
Lower Columbia River conditions; stage at Vancouver: 5.4 m NAVD88, stage at St. Helens: 4.8 m NAVD88; river flow 170,000 cfs.

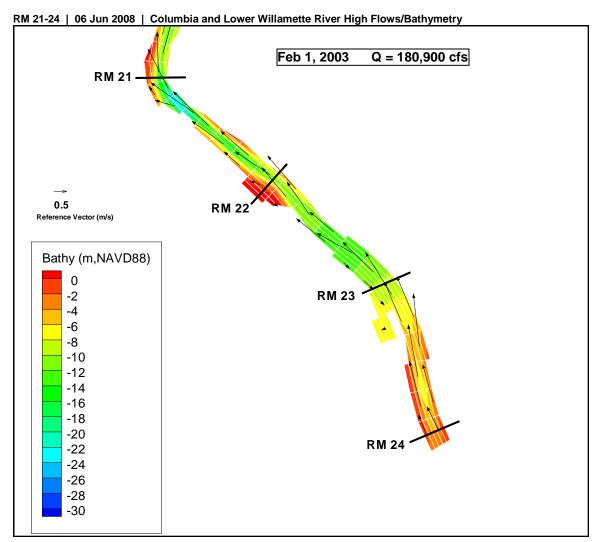
Figure 3.1-13f Portland Harbor RI/FS Remedial Investigation Report Vector Velocity Plot, High Flow RM 16-19



Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

Figure 3.1-13g
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 19–22



Additional Notes: Bathymet

Bathymetric data collected in Feb 2004.

Time Series Data for February 1, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.9 m NAVD88; river flow 180,900 cfs

Figure 3.1-13h
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
RM 21–24

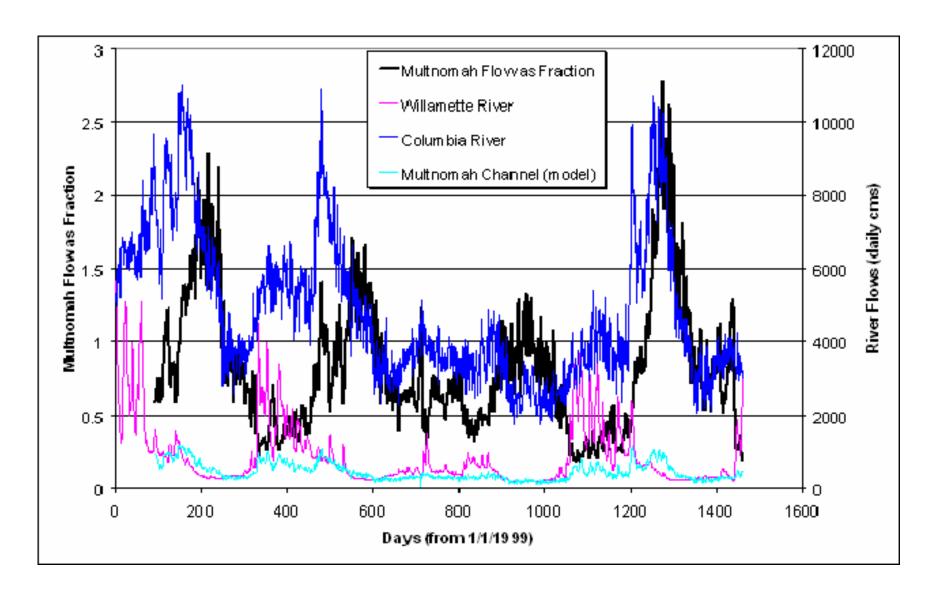
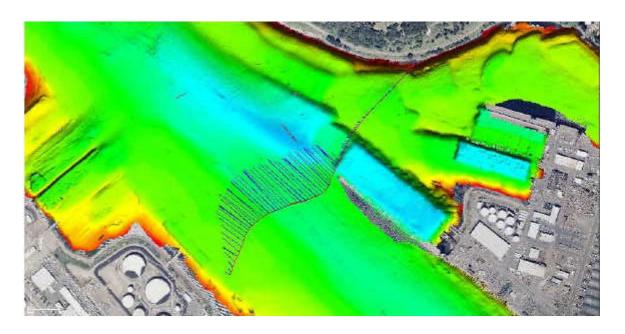
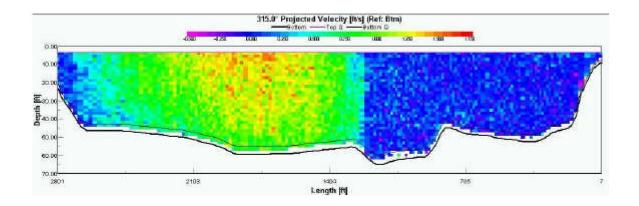


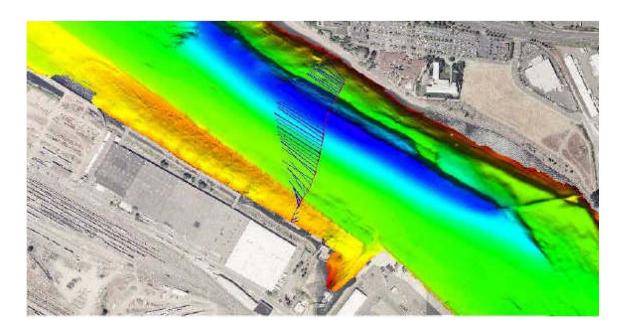
Figure 3.1-14
Portland Harbor RI/FS
Remedial Investigation Report
Willamette and Columbia River Flows and
Modeled Multnomah Channel Flows
as a Fraction of the Willamette Flow



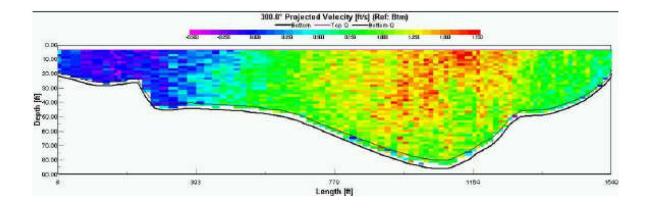
a.Vector Plot (ADCP Data) of the Water-column-averaged Velocity, Magnitude, and Direction at Transect 11, RM 8



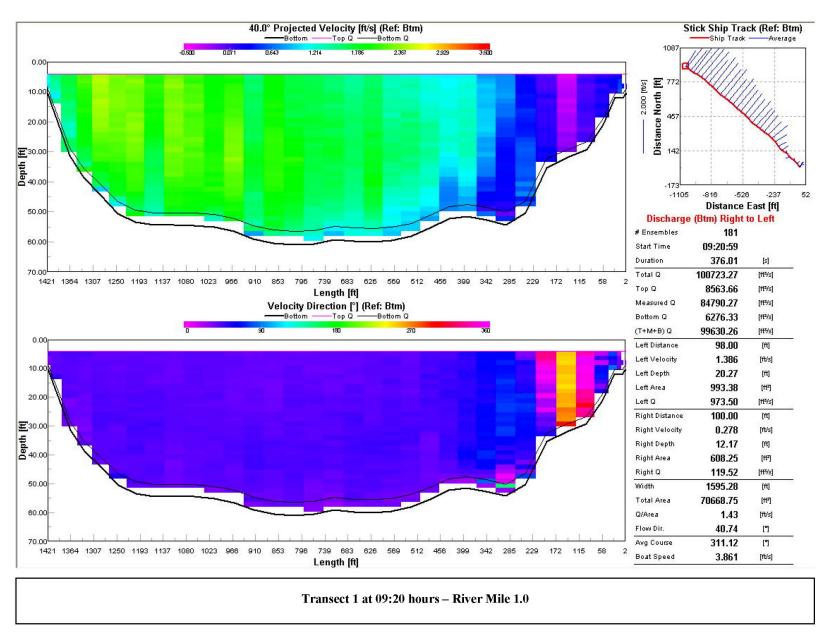
b.Vector Profile of the Velocity Measured Perpendicular to Transect 11 at RM 8 on April 19, 2002



a.Vector Plot (ADCP Data) of the Water-column-averaged Velocity, Magnitude, and Direction at Transect 14, RM 9.6

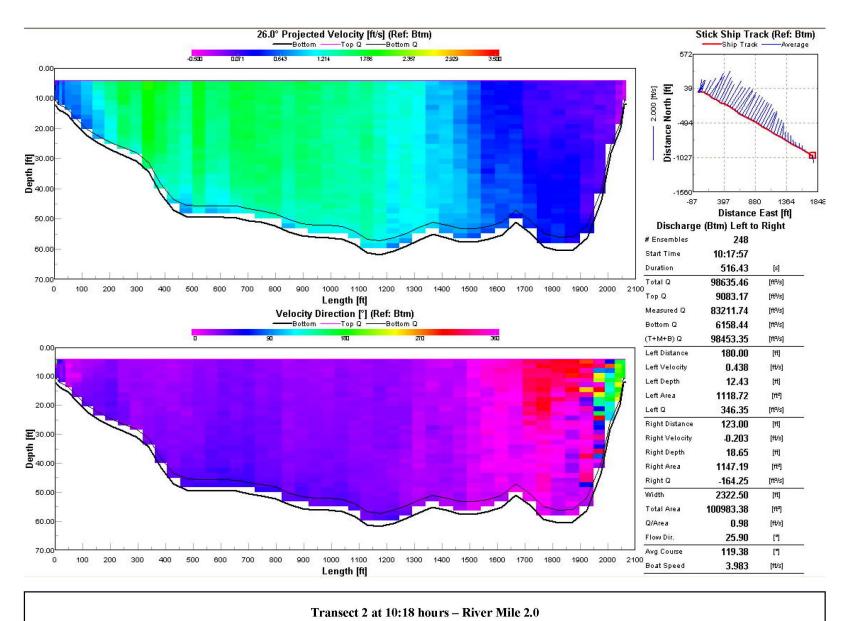


b.Vector Profile of the Velocity Measured Perpendicular to Transect 14 at RM 8 on April 19, 2002



Source: DEA (2004b)

Figure 3.1-17a
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Source: DEA (2004b)

Figure 3.1-17b
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

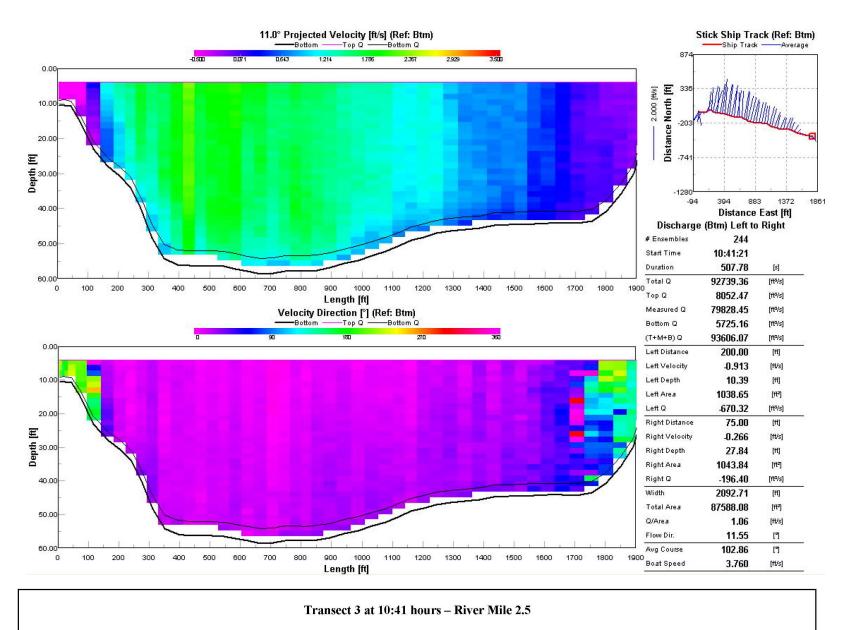
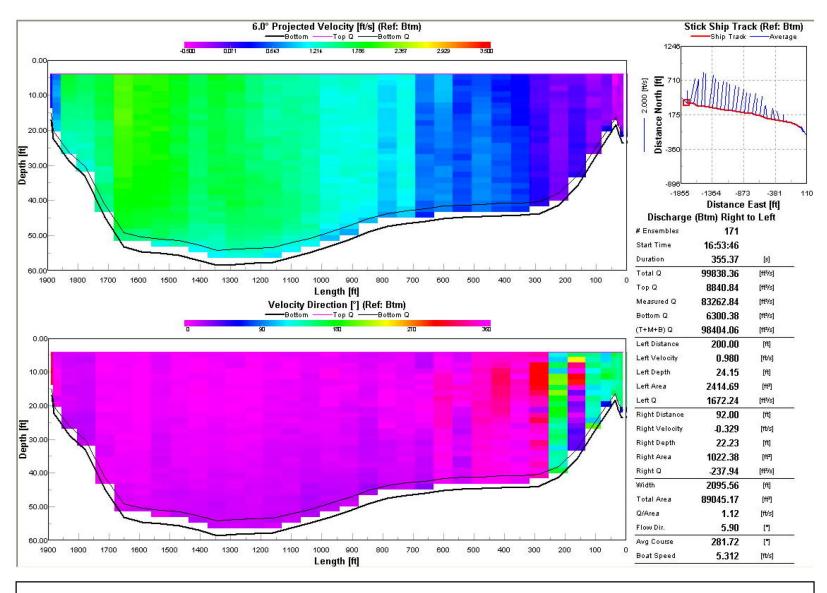
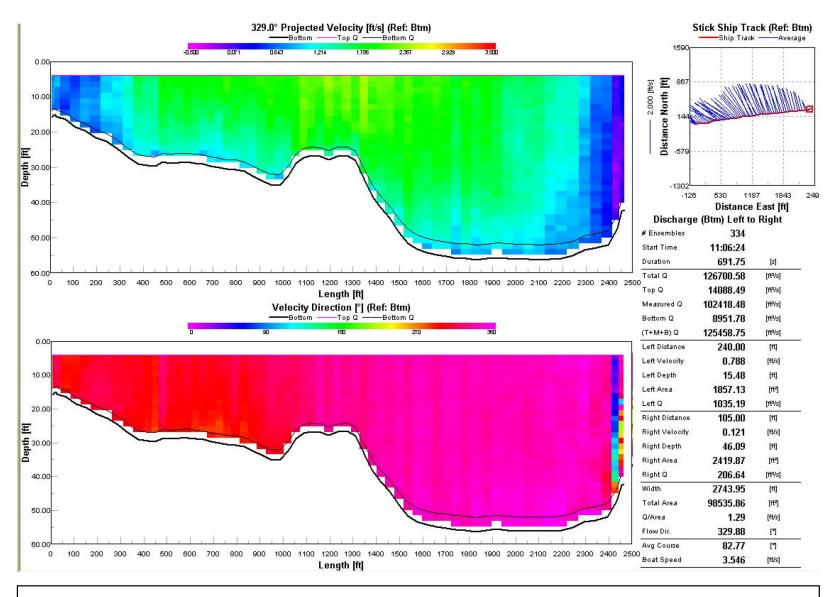


Figure 3.1-17c
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



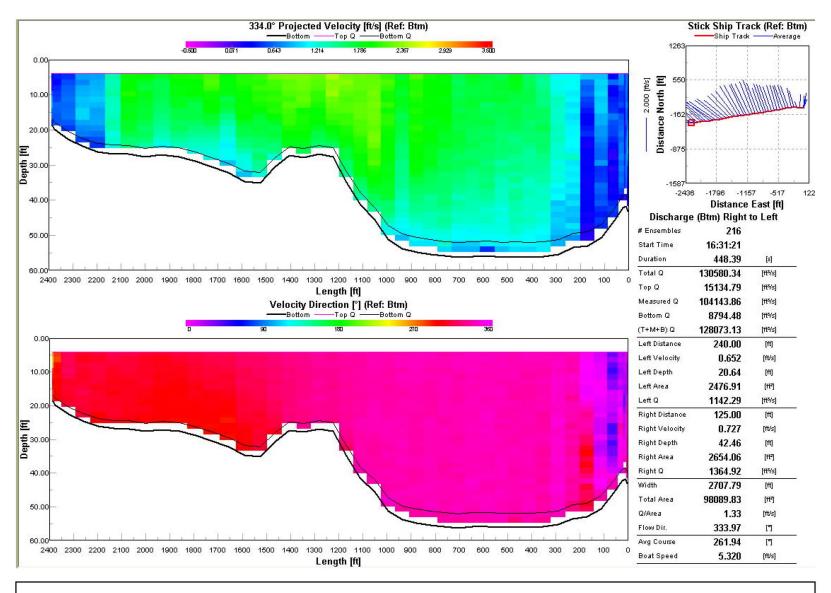
Transect 3 at 16:53 hours – River Mile 2.5

Figure 3.1-17d
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



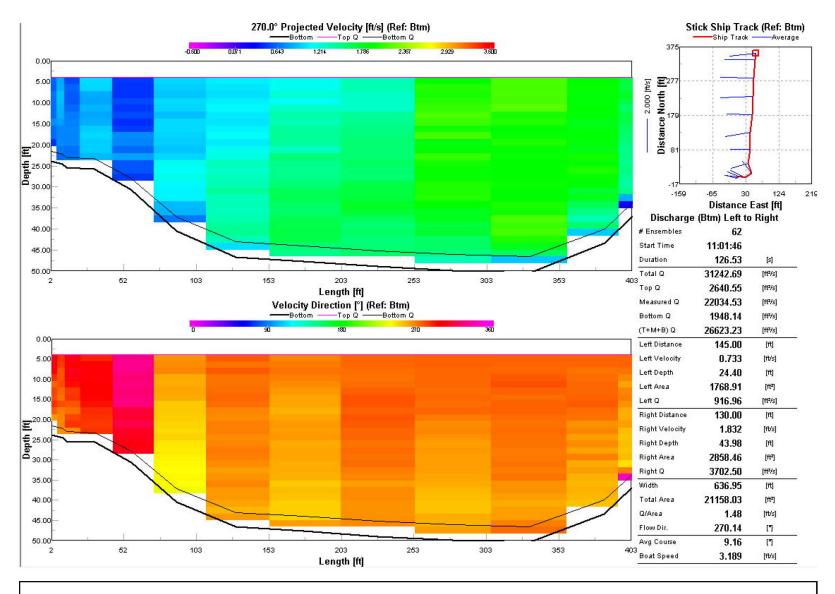
Transect 4 at 11:06 hours – River Mile 3.1 at Entrance to Multnomah Channel

Figure 3.1-17e
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



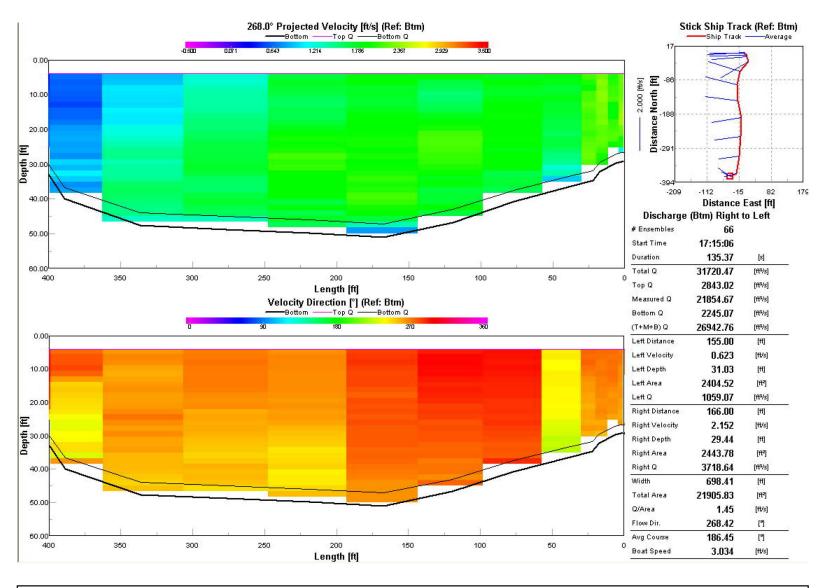
Transect 4 at 16:31 hours - River Mile 3.1 at Entrance to Multnomah Channel

Figure 3.1-17f
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



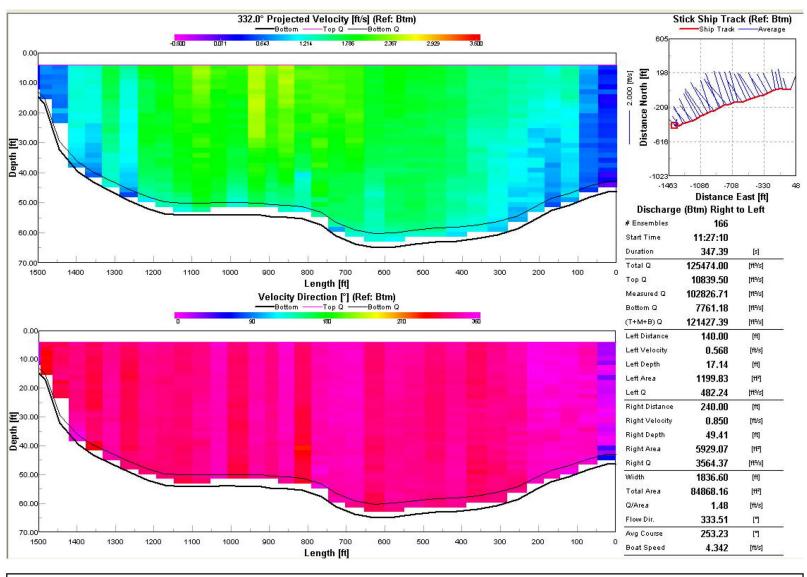
Transect 17 at 11:01 hours – Multnomah Channel

Figure 3.1-17g
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Transect 17 at 17:15 hours – Multnomah Channel

Figure 3.1-17h
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Transect 5 at 11:26 hours – River Mile 4.0

Figure 3.1-17i
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

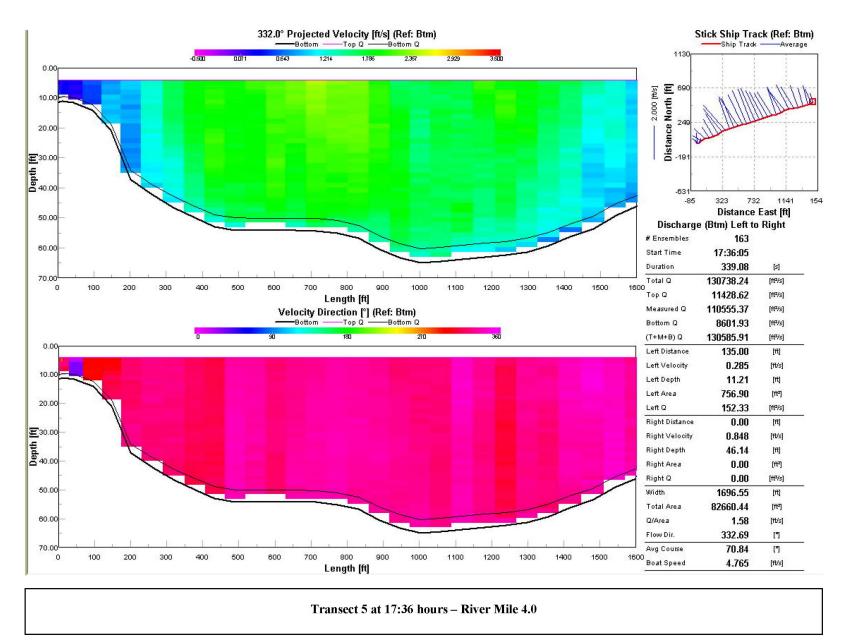


Figure 3.1-17j
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

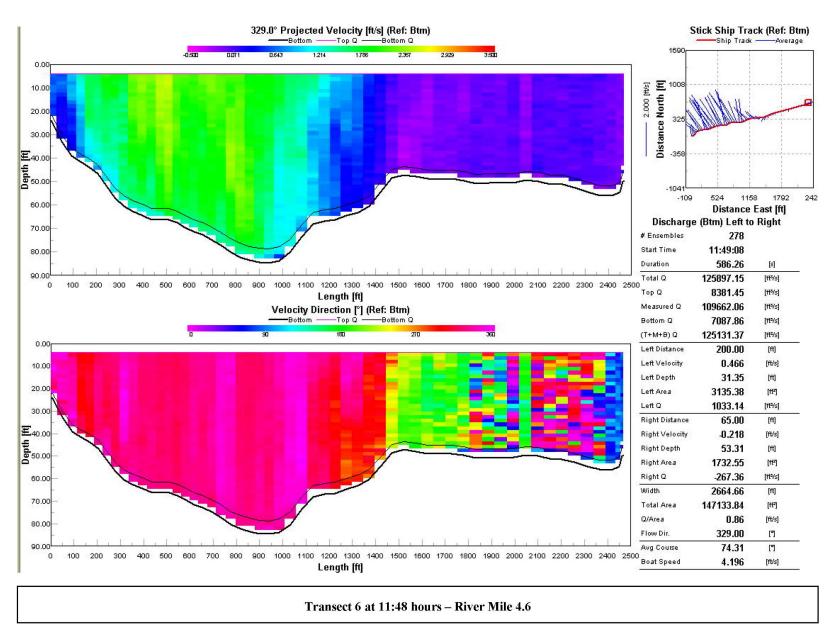


Figure 3.1-17k
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

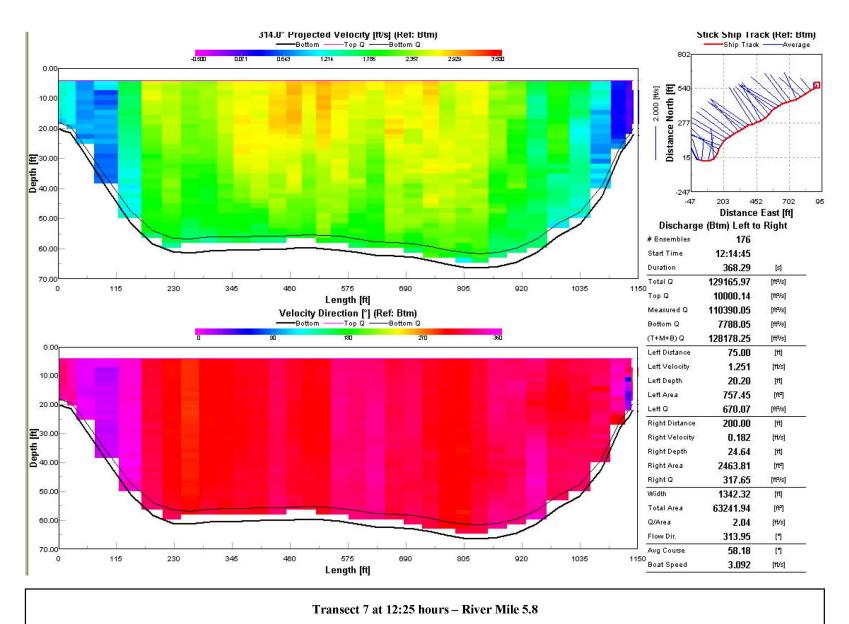
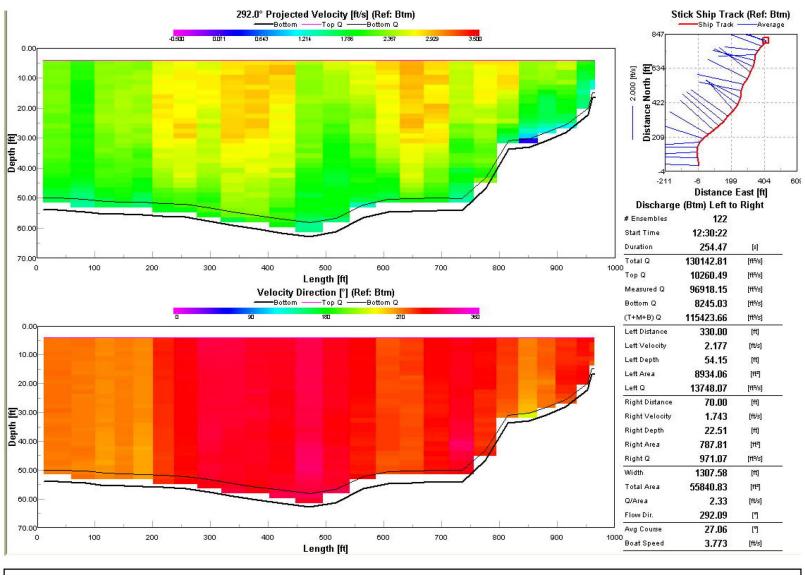


Figure 3.1-17I
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Transect 8 at 12:29 hours – River Mile 6.3

Figure 3.1-17m
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

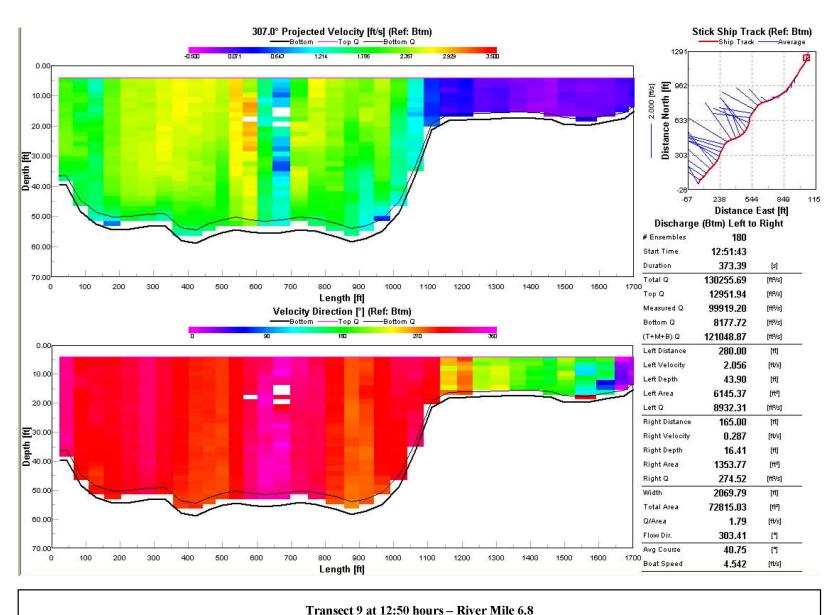


Figure 3.1-17n
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

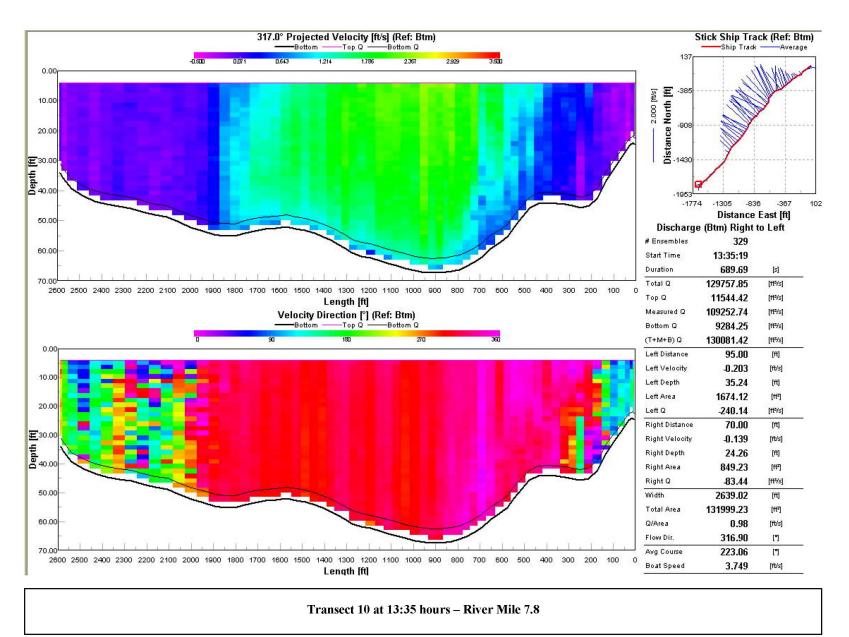


Figure 3.1-17o
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

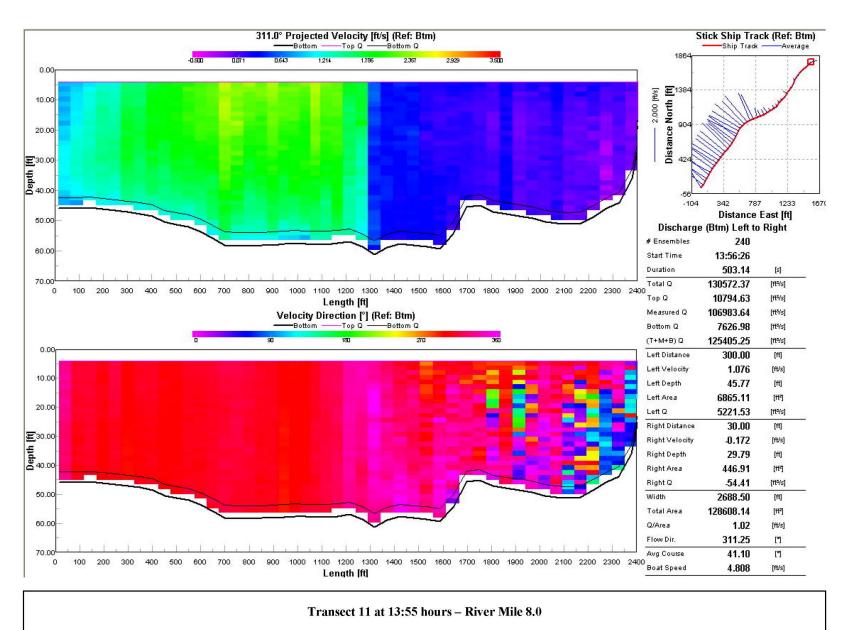
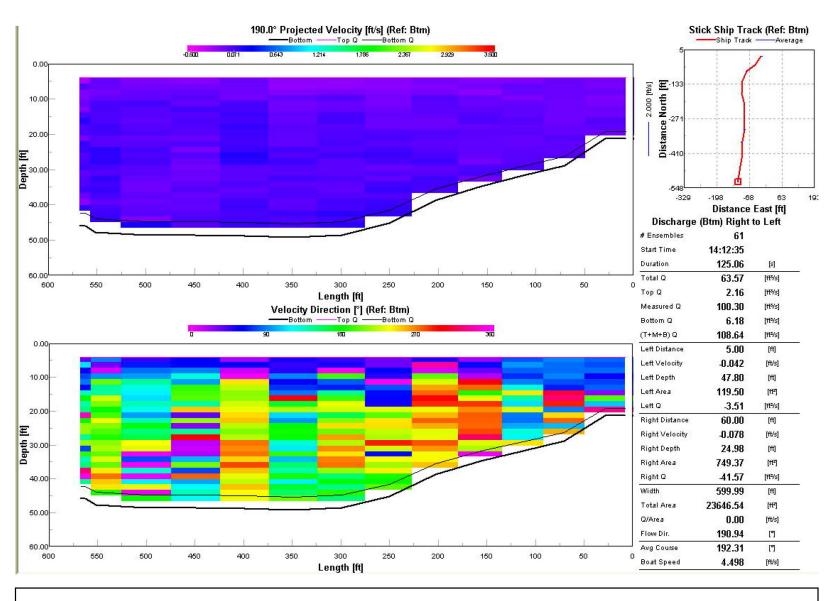


Figure 3.1-17p
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Transect 12 at 14:11 hours – Entrance to Swan Island Lagoon

Figure 3.1-17q
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

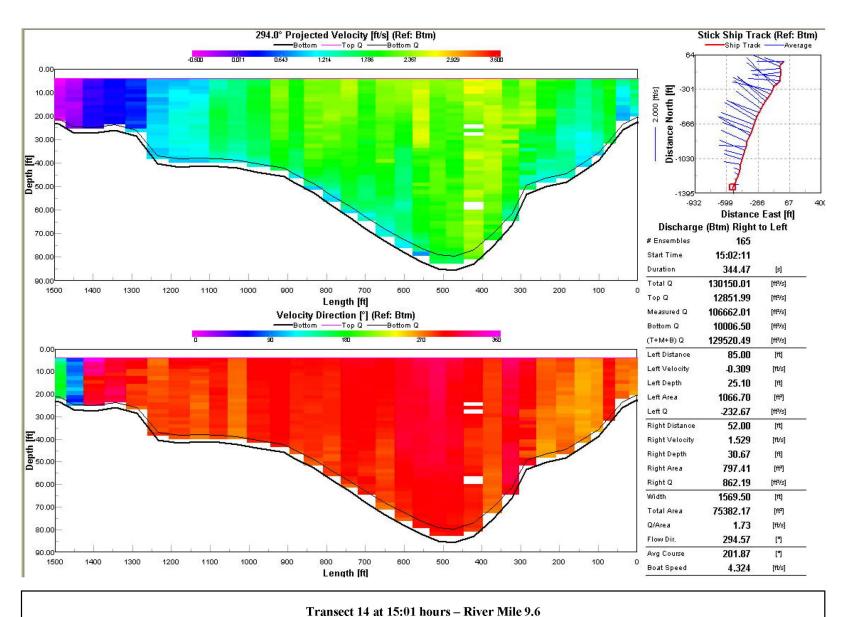


Figure 3.1-17r
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

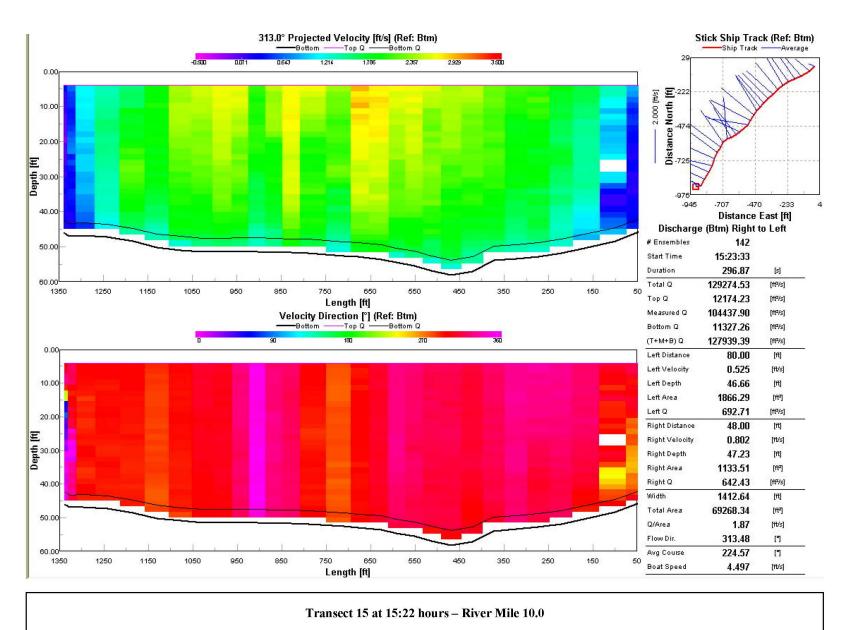


Figure 3.1-17s
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data

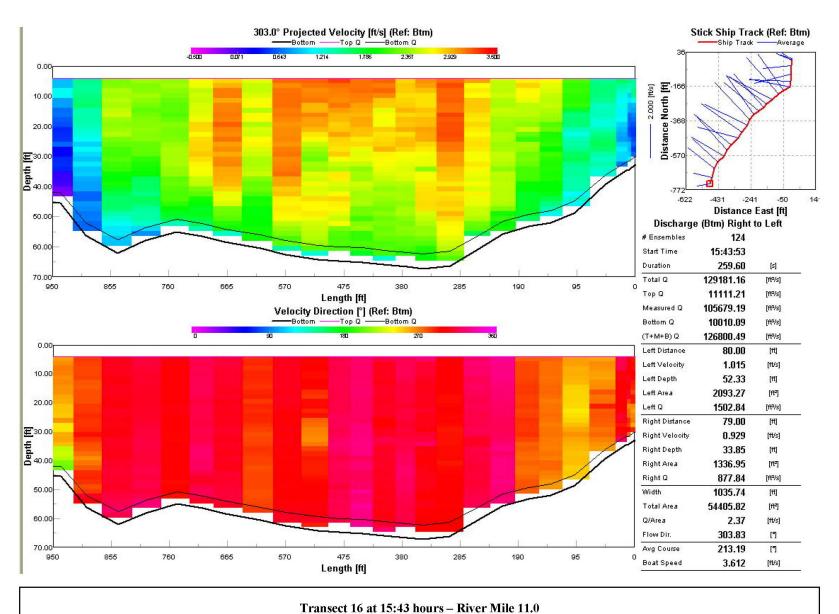
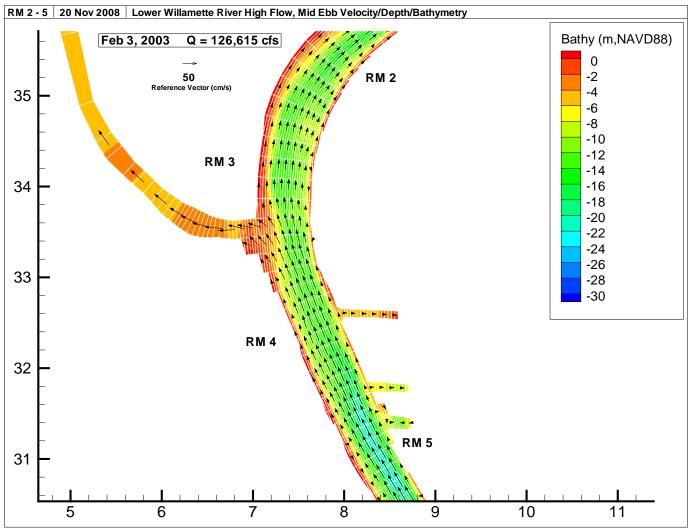


Figure 3.1-17t
Portland Harbor RI/FS
Remedial Investigation Report
ADCP Survey Winter 2004 Transect Data



Additional Notes:

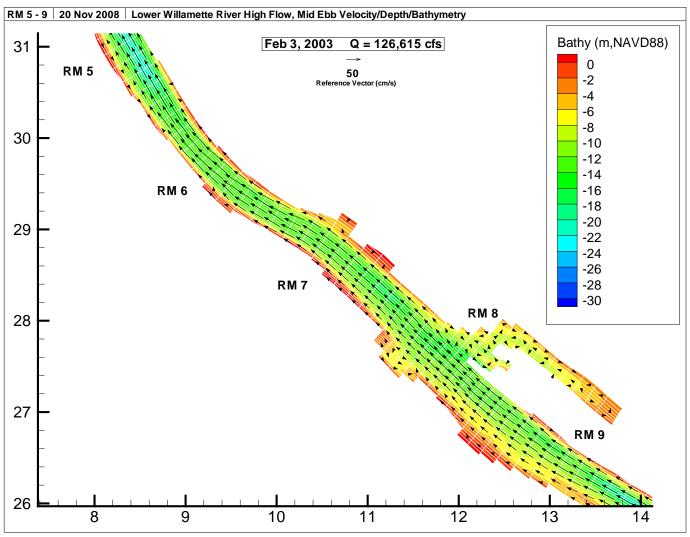
Bathymetric data collected in Feb 2004.

Time Series Data for February 3, 2003 at 1800hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 3.5 m NAVD88; river flow 126,615 cfs

Lower Columbia River conditions; stage at Vancouver: 5.0 m NAVD88, stage at St. Helens: 4.5 m NAVD88; river flow 178,000 cfs.

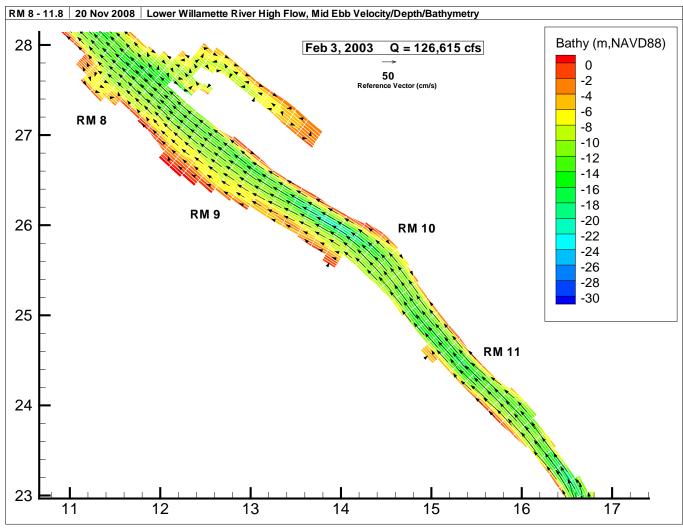
Figure 3.1-18a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
Mid Ebb, RM 2–5



Bathymetric data collected in Feb 2004. Additional Notes:

Time Series Data for February 3, 2003 at 1800hrs; Lower Willamette River conditions; stage at Morrison St. Bridge: 3.5 m NAVD88; river flow 126,615 cfs

Figure 3.1-18b Portland Harbor RI/FS Remedial Investigation Report Vector Velocity Plot, High Flow Mid Ebb, RM 5-9

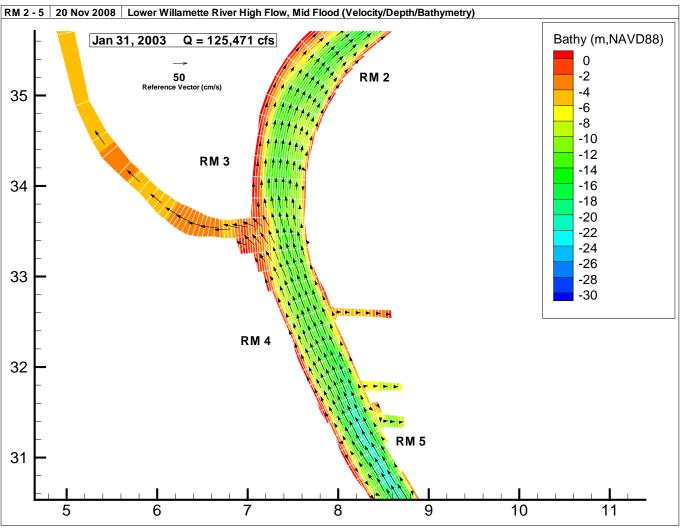


Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for February 3, 2003 at 1800hrs;

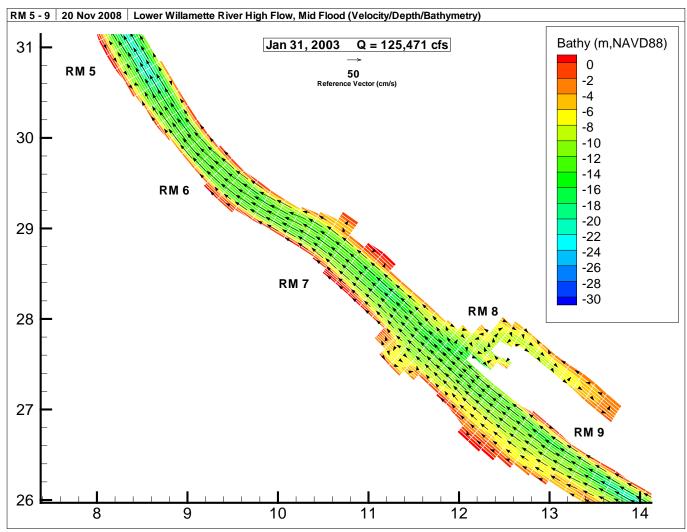
Lower Willamette River conditions; stage at Morrison St. Bridge: 3.5 m NAVD88; river flow 126,615 cfs Lower Columbia River conditions; stage at Vancouver: 5.0 m NAVD88, stage at St. Helens: 4.5 m NAVD88; river flow 178,000 cfs.

Figure 3.1-18c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
Mid Ebb, RM 8–11.8



Additional Notes: Bathymetric data collected in Feb 2004.
Time Series Data for January 31, 2003 at 0300hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 2.5 m NAVD88; river flow 125,471 cfs
Lower Columbia River conditions; stage at Vancouver: 4.1 m NAVD88, stage at St. Helens: 3.8 m NAVD88; river flow 150,000 cfs.

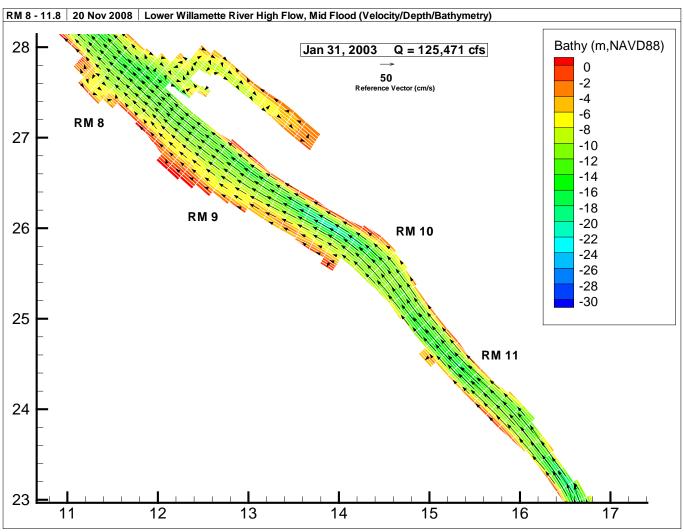
Figure 3.1-19a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
Mid Flood, RM 2–5



Additional Notes:

Bathymetric data collected in Feb 2004.
Time Series Data for January 31, 2003 at 0300hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 2.5 m NAVD88; river flow 125,471 cfs
Lower Columbia River conditions; stage at Vancouver: 4.1 m NAVD88, stage at St. Helens: 3.8 m NAVD88; river flow 150,000 cfs.

Figure 3.1-19b
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
Mid Flood, RM 5–9



Additional Notes:

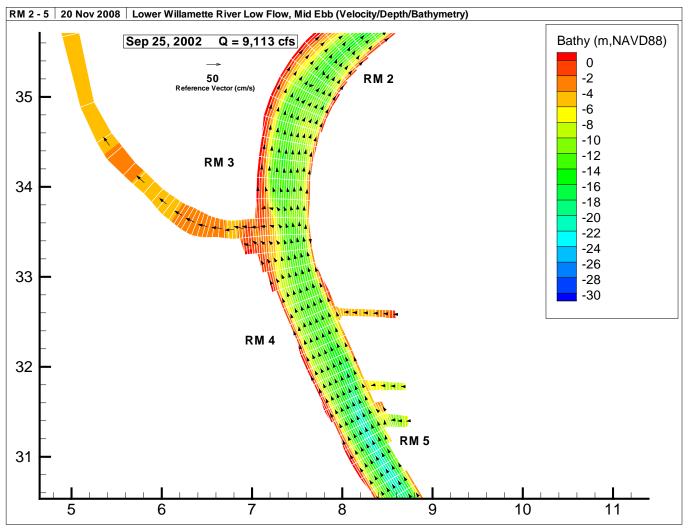
Bathymetric data collected in Feb 2004.

Time Series Data for January 31, 2003 at 0300hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 2.5 m NAVD88; river flow 125,471 cfs

Lower Columbia River conditions; stage at Vancouver: 4.1 m NAVD88, stage at St. Helens: 3.8 m NAVD88; river flow 150,000 cfs.

Figure 3.1-19c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, High Flow
Mid Flood, RM 8–11.8

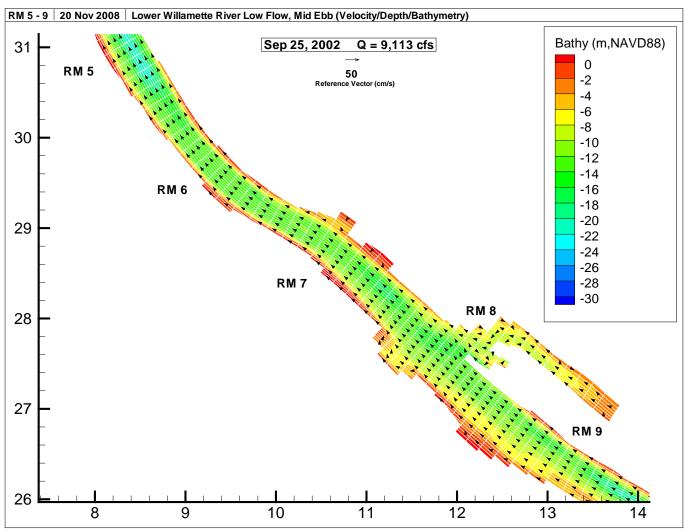


Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for September 25, 2002 at 1600hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 0.4 m NAVD88; river flow 9,113 cfs
Lower Columbia River conditions; stage at Vancouver: 2.1 m NAVD88, stage at St. Helens: 2.3 m NAVD88; river flow 130,000 cfs.

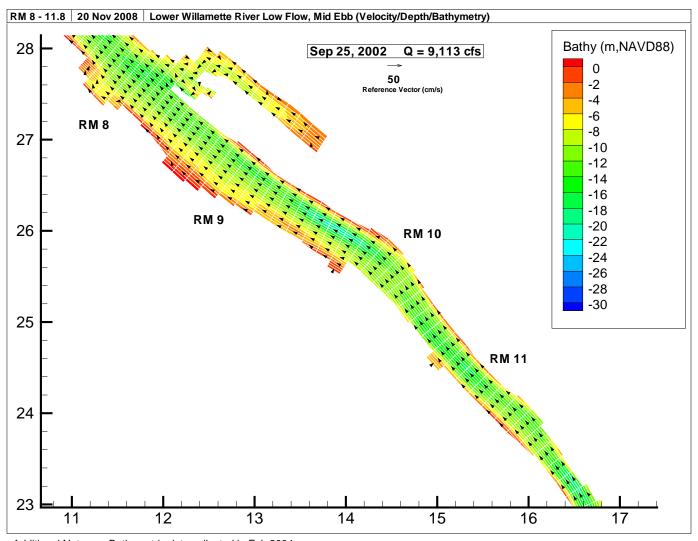
Figure 3.1-20a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Ebb, RM 2—5



Additional Notes:

Bathymetric data collected in Feb 2004.
Time Series Data for September 25, 2002 at 1600hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 0.4 m NAVD88; river flow 9,113 cfs
Lower Columbia River conditions; stage at Vancouver: 2.1 m NAVD88, stage at St. Helens: 2.3 m NAVD88; river flow 130,000 cfs.

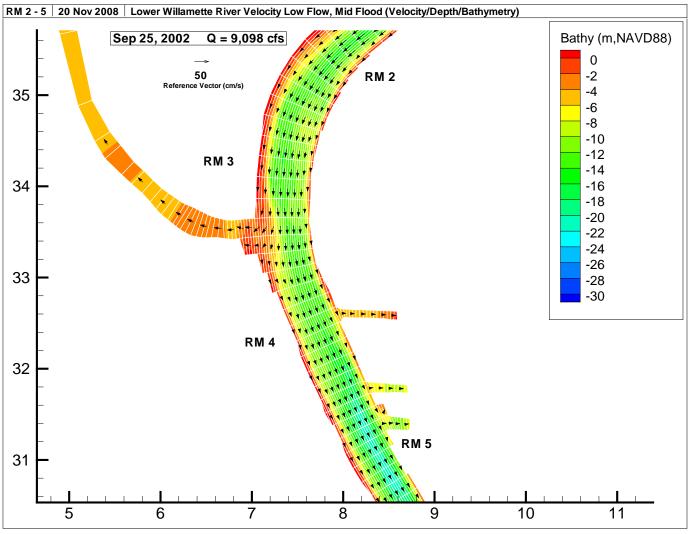
Figure 3.1-20b
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Ebb, RM 5–9



Additional Notes:

Bathymetric data collected in Feb 2004.
Time Series Data for September 25, 2002 at 1600hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 0.4 m NAVD88; river flow 9,113 cfs
Lower Columbia River conditions; stage at Vancouver: 2.1 m NAVD88, stage at St. Helens: 2.3 m NAVD88; river flow 130,000 cfs.

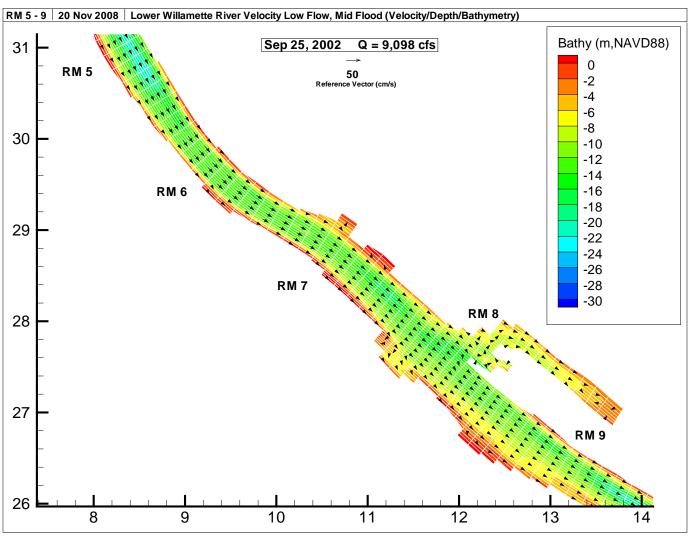
Figure 3.1-20c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Ebb, RM 8–11.8



Additional Notes:

Bathymetric data collected in Feb 2004.
Time Series Data for September 25, 2002 at 1930hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 1.3 m NAVD88; river flow 9,098 cfs
Lower Columbia River conditions; stage at Vancouver: 3.0 m NAVD88, stage at St. Helens: 2.6 m NAVD88; river flow 130,000 cfs.

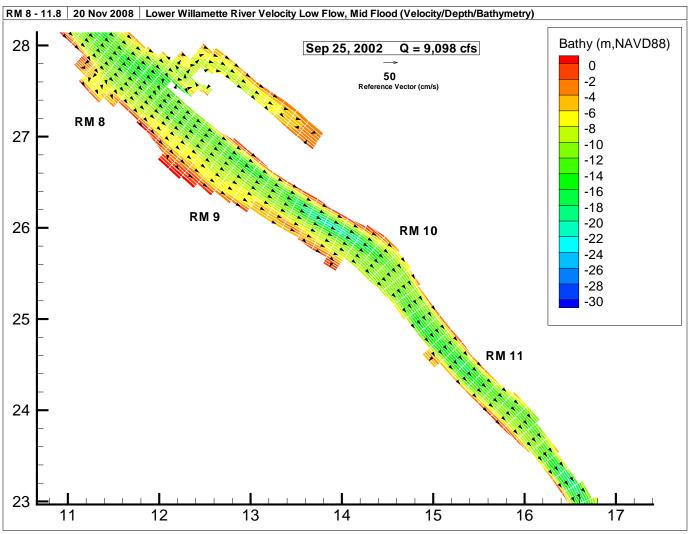
Figure 3.1-21a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Flood, RM 2–5



Additional Notes: Bathymetric data collected in Feb 2004.
Time Series Data for September 25, 2002 at 1930hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.3 m NAVD88; river flow 9,098 cfs
Lower Columbia River conditions; stage at Vancouver: 3.0 m NAVD88, stage at St. Helens: 2.6 m NAVD88; river flow 130,000 cfs.

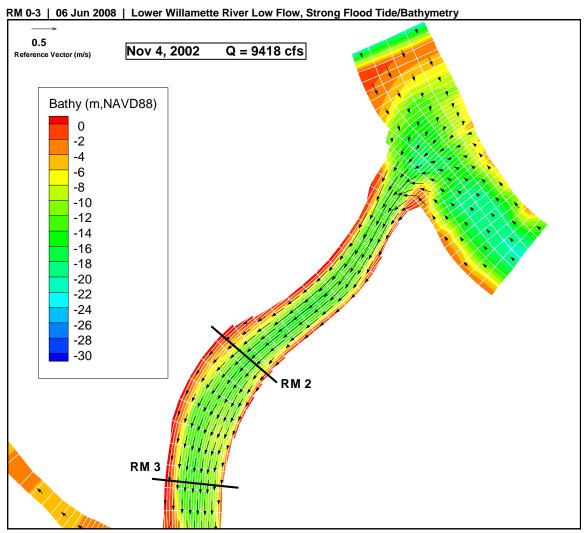
Figure 3.1-21b
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Flood, RM 5–9



Additional Notes:

Bathymetric data collected in Feb 2004.
Time Series Data for September 25, 2002 at 1930hrs;
Lower Willamette River conditions; stage at Morrison St. Bridge: 1.3 m NAVD88; river flow 9,098 cfs
Lower Columbia River conditions; stage at Vancouver: 3.0 m NAVD88, stage at St. Helens: 2.6 m NAVD88; river flow 130,000 cfs.

Figure 3.1-21c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Mid Flood, RM 8–11.8

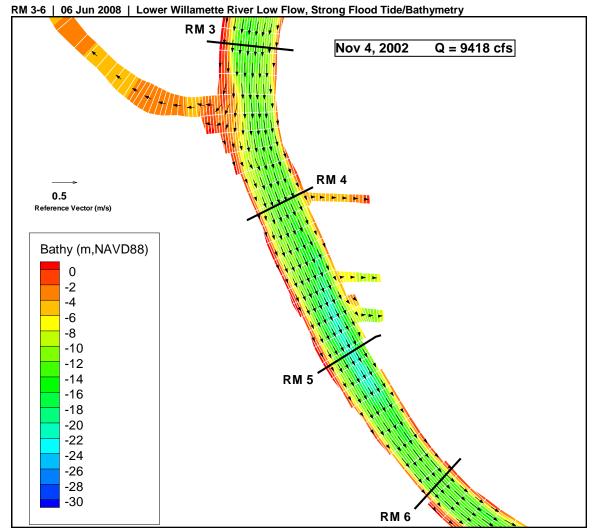


Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Figure 3.1-22a
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 0–3



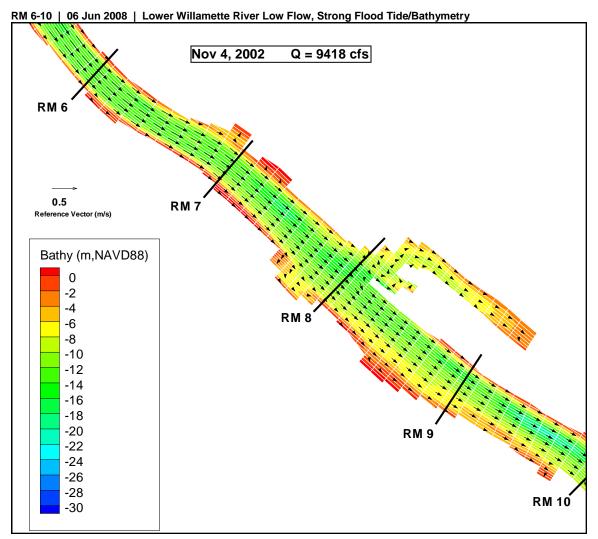
Additional Notes:

Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs
Lower Columbia River conditions; stage at Vancouver: 2.8 m NAVD88, stage at St. Helens: 2.9 m NAVD88; river flow 130,000 cfs.

Figure 3.1-22b Portland Harbor RI/FS Remedial Investigation Report Vector Velocity Plot, Low Flow Strong Flood, RM 3-6



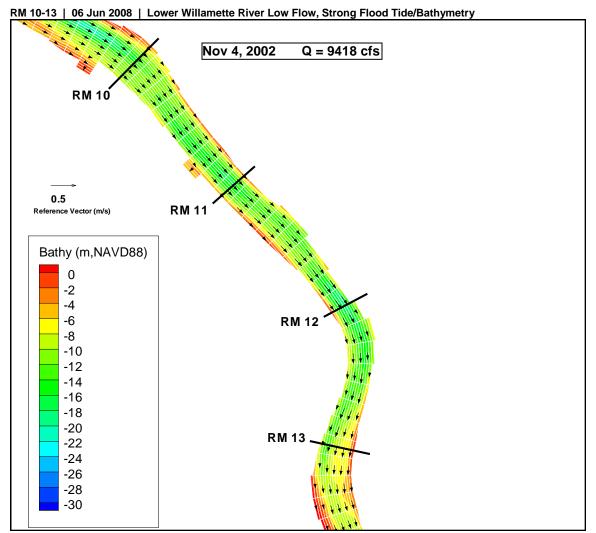
Additional Notes:

Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Figure 3.1-22c
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 6–10

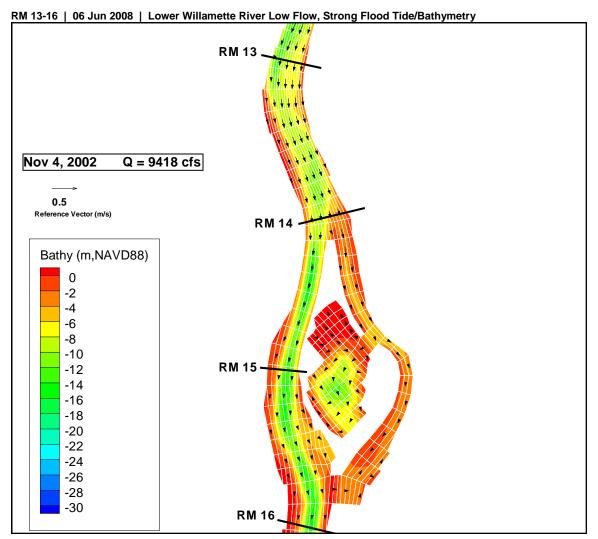


Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Figure 3.1-22d
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 10–13



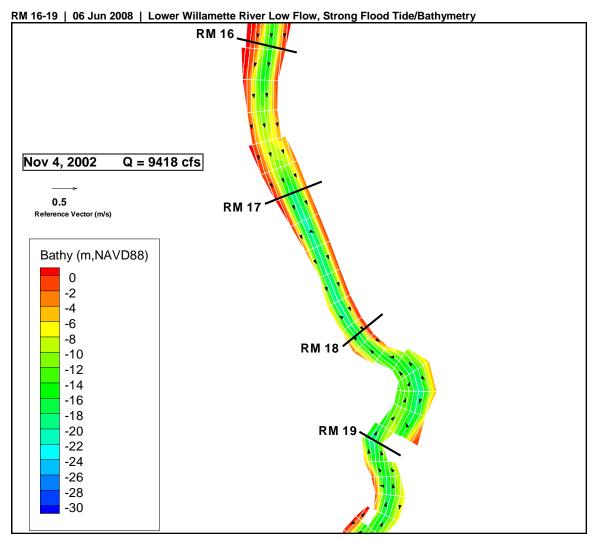
Additional Notes:

Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Figure 3.1-22e
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 13–16



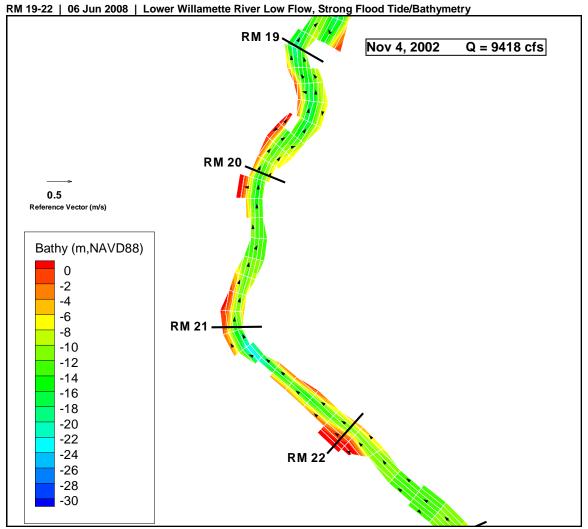
Additional Notes: Ba

Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Figure 3.1-22f
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 16–19



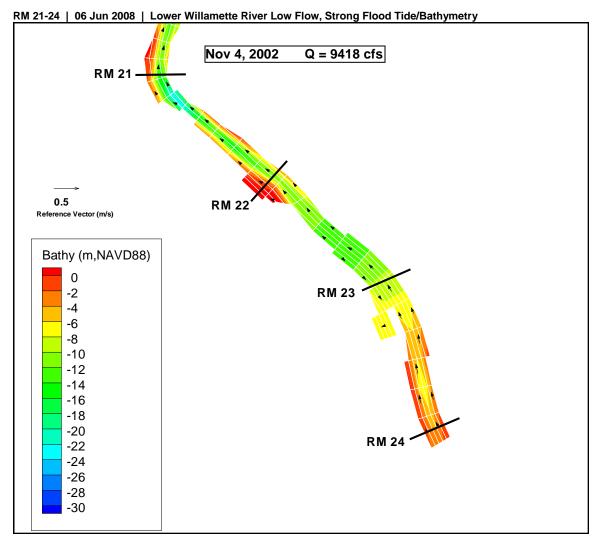
Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Lower Columbia River conditions; stage at Vancouver: 2.8 m NAVD88, stage at St. Helens: 2.9 m NAVD88; river flow 130,000 cfs.

Figure 3.1-22g
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 19–22



Additional Notes: Bathymetric data collected in Feb 2004.

Time Series Data for November 4, 2002 at 1500hrs;

Lower Willamette River conditions; stage at Morrison St. Bridge: 1.5 m NAVD88; river flow 9,418 cfs

Lower Columbia River conditions; stage at Vancouver: 2.8 m NAVD88, stage at St. Helens: 2.9 m NAVD88; river flow 130,000 cfs.

Figure 3.1-22h
Portland Harbor RI/FS
Remedial Investigation Report
Vector Velocity Plot, Low Flow
Strong Flood, RM 21–24

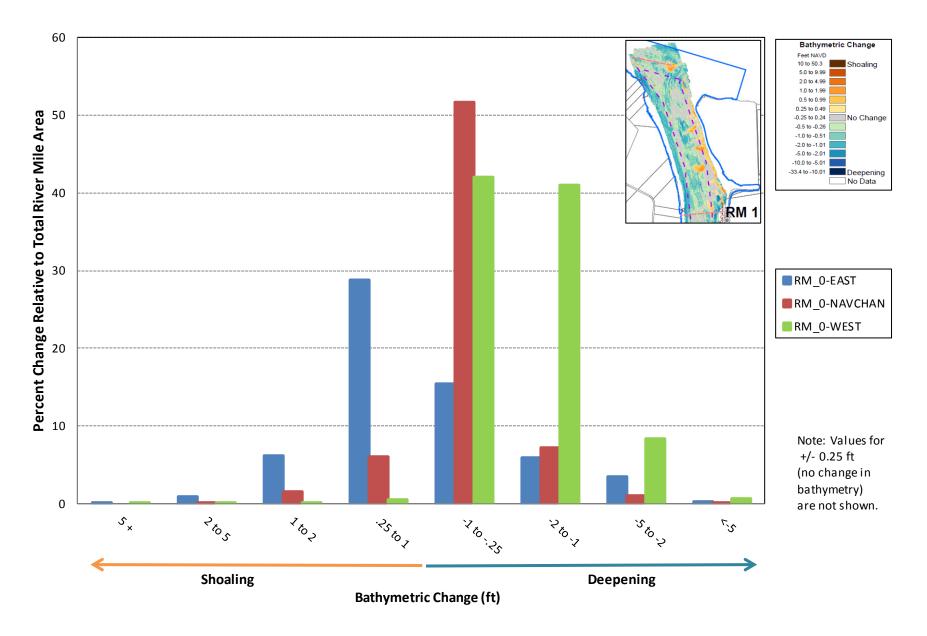


Figure 3.1-23a
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 0 to 1

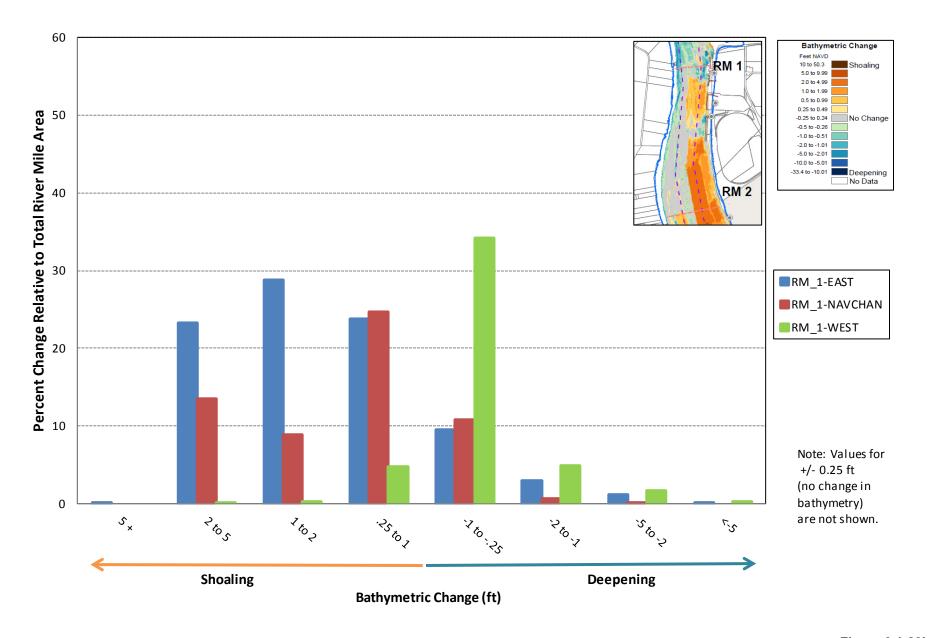


Figure 3.1-23b
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 1 to 2

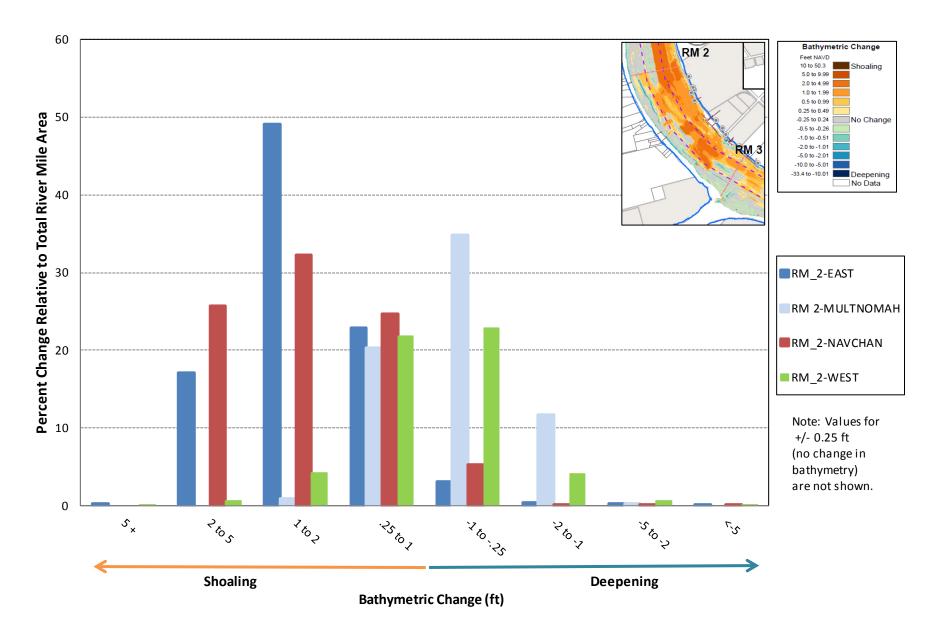


Figure 3.1-23c
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 2 to 3

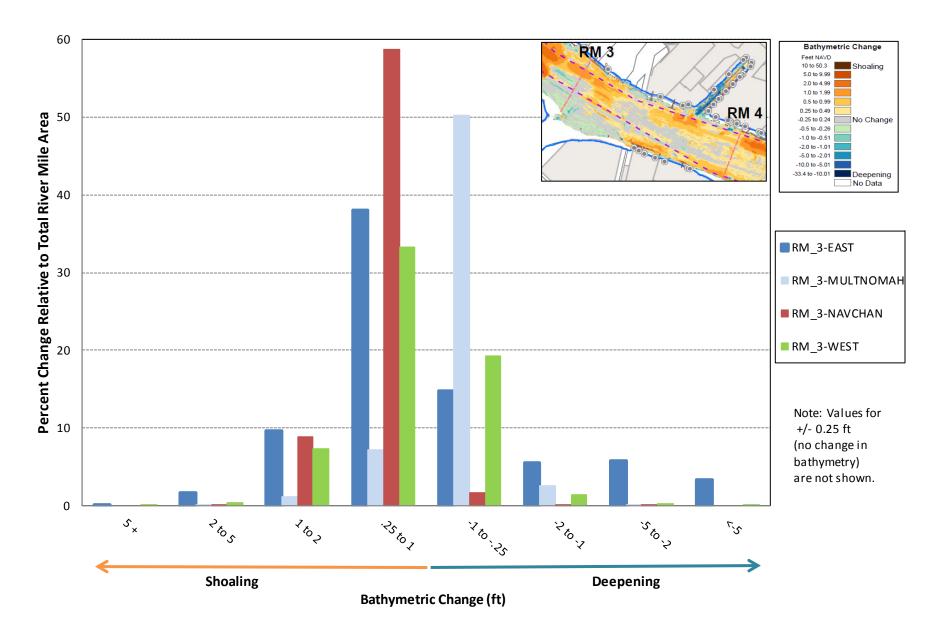


Figure 3.1-23d
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 3 to 4

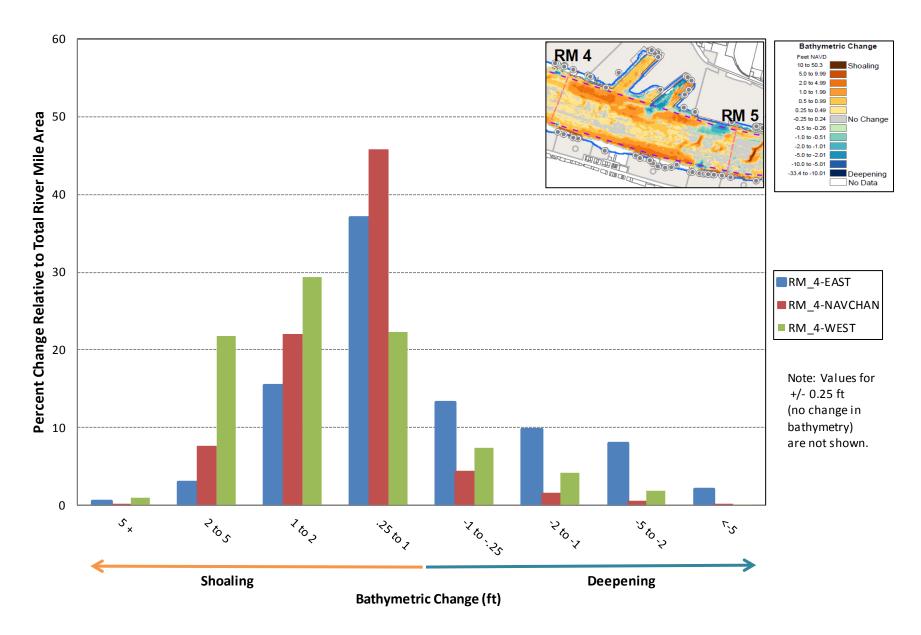


Figure 3.1-23e
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 4 to 5

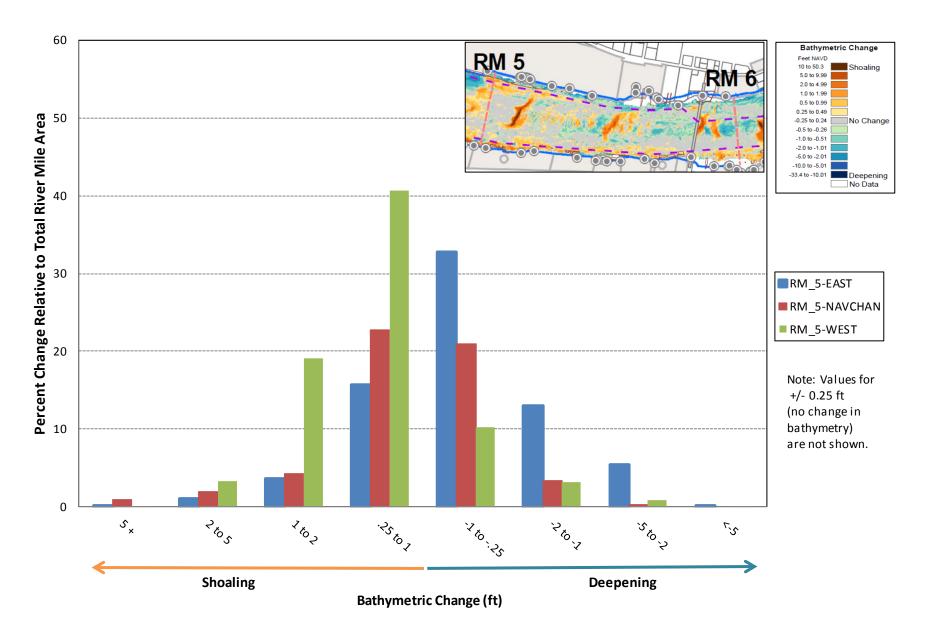


Figure 3.1-23f
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 5 to 6

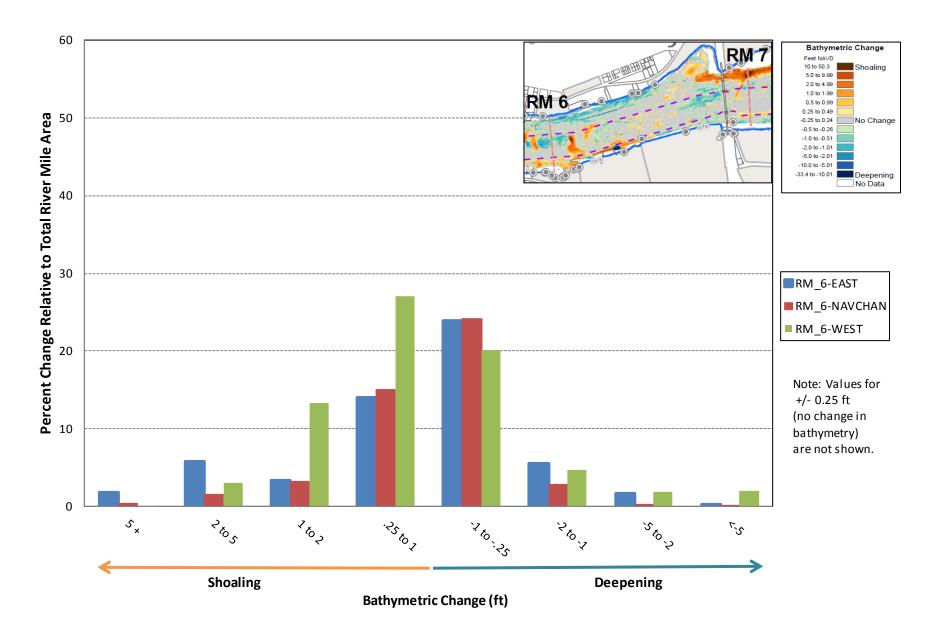


Figure 3.1-23g
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 6 to 7

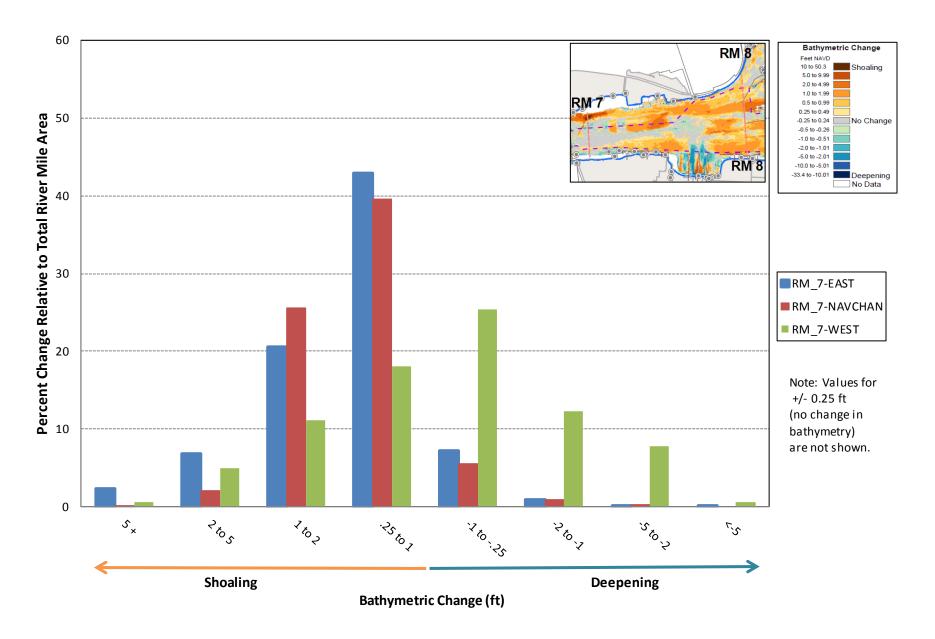


Figure 3.1-23h
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 7 to 8

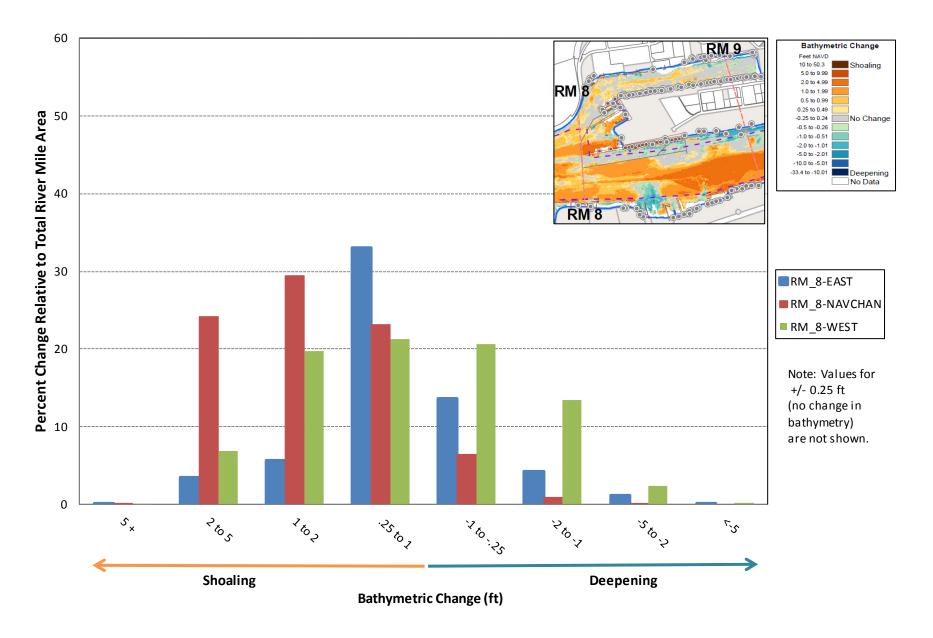


Figure 3.1-23i
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 8 to 9

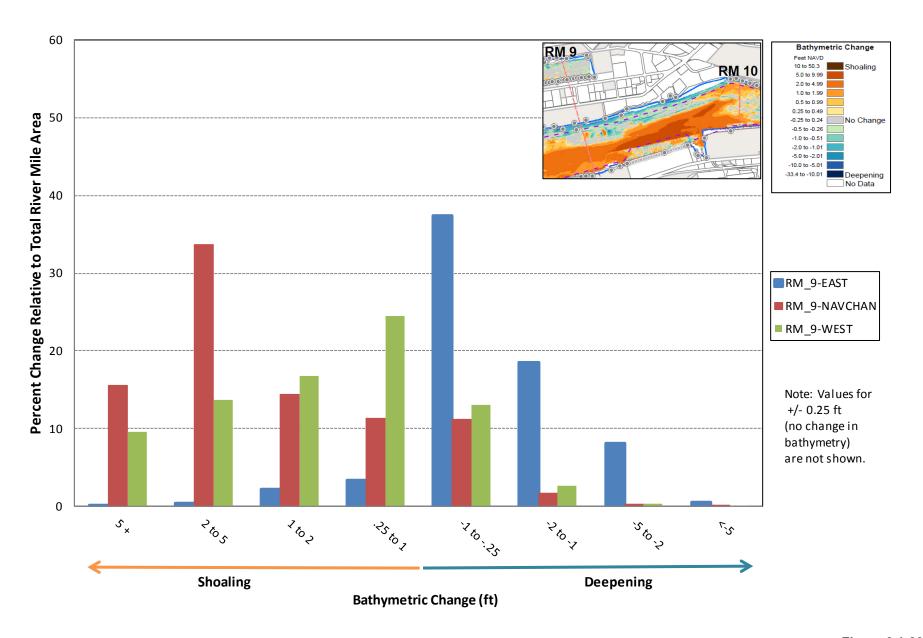


Figure 3.1-23j
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 9 to 10

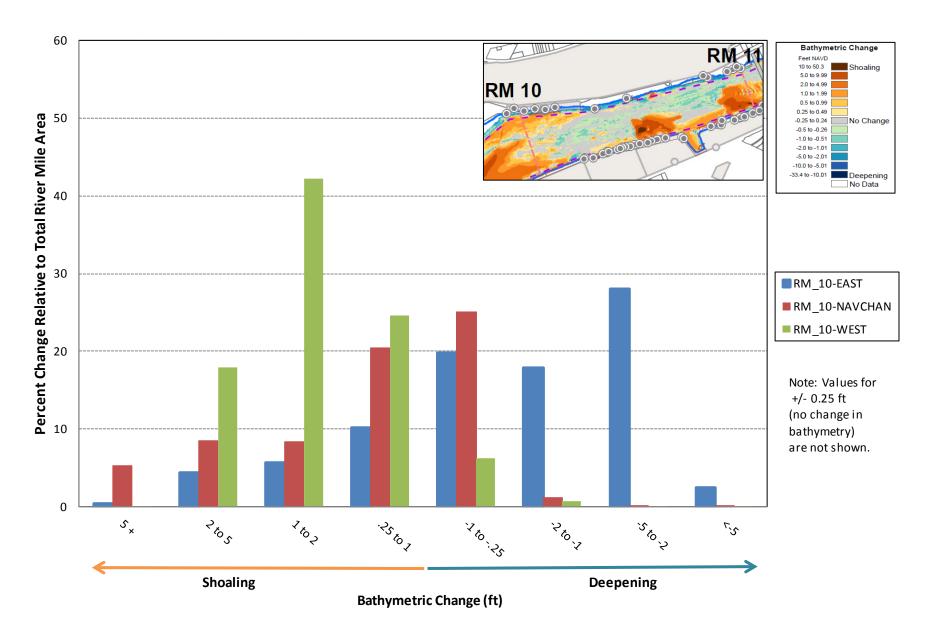


Figure 3.1-23k
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 10 to 11

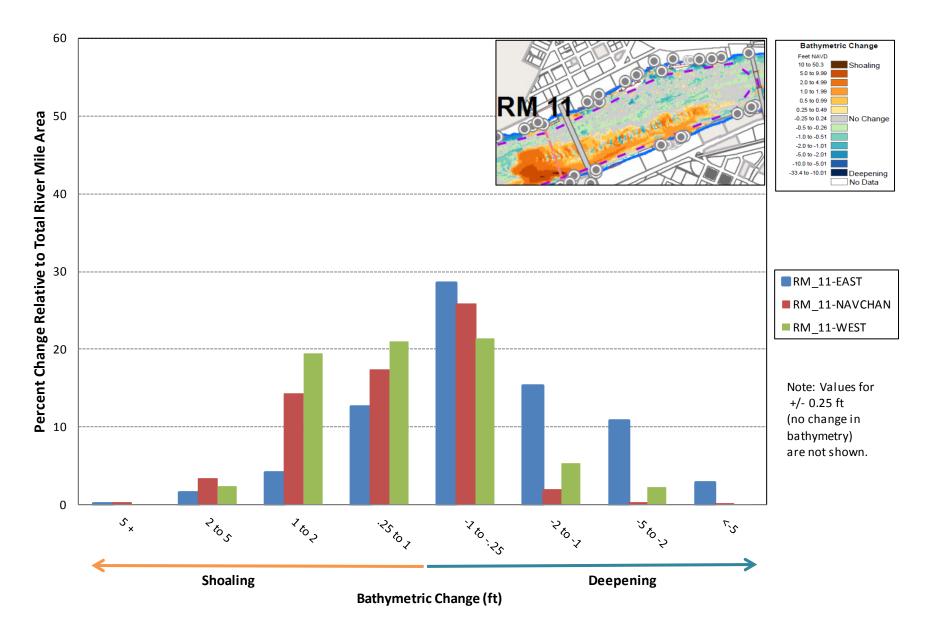


Figure 3.1-23I
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
RM 11 to End of Navigation Channel

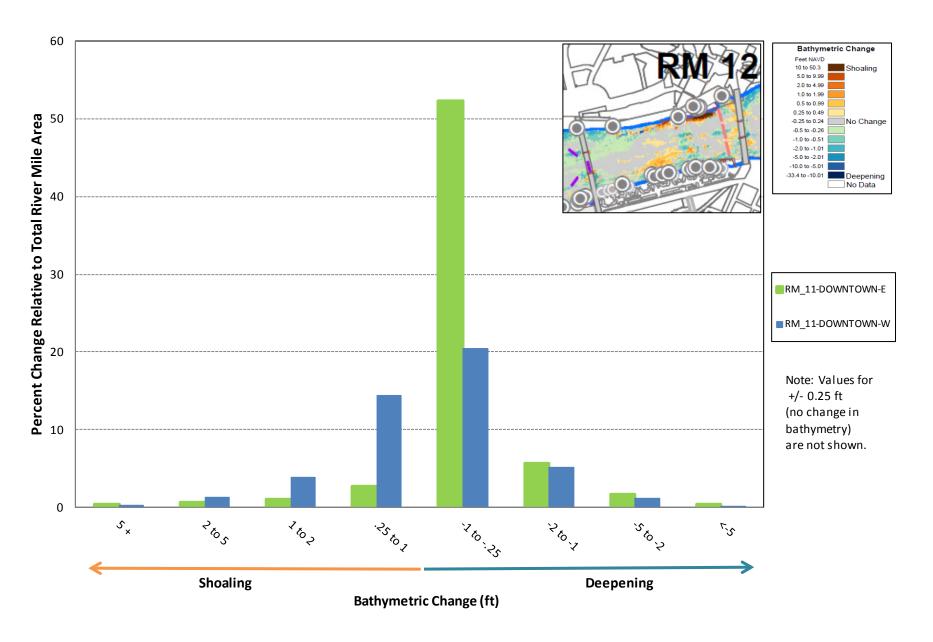


Figure 3.1-23m
Portland Harbor RI/FS
Remedial Investigation Report
Portland Harbor 2002–2009 Bathymetric Change
End of Navigation Channel to RM 11.8

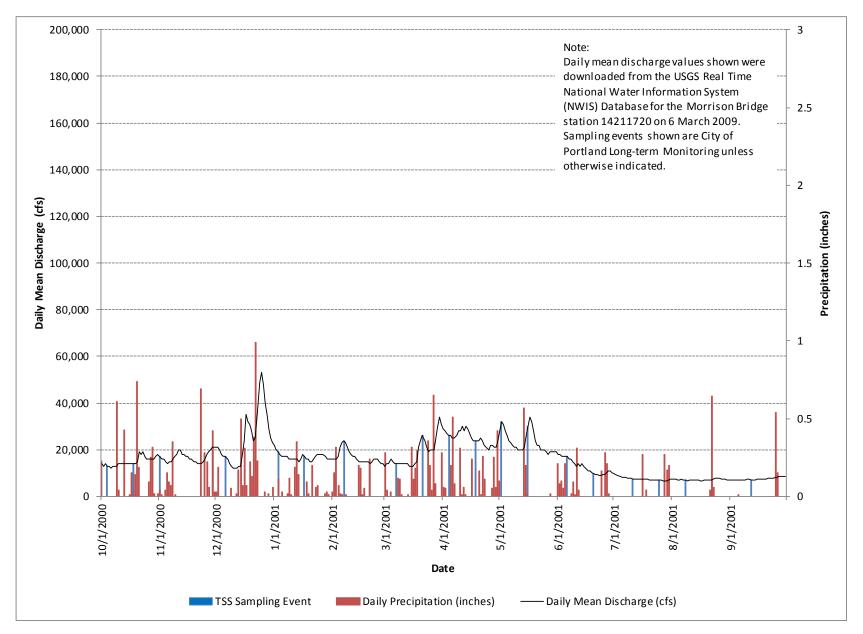


Figure 3.1-24a
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2001

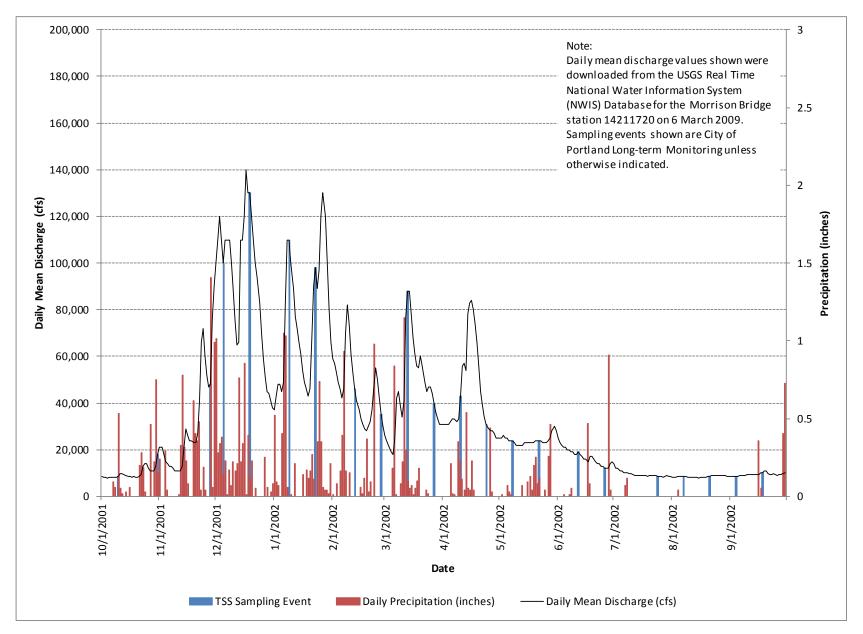


Figure 3.1-24b
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2002

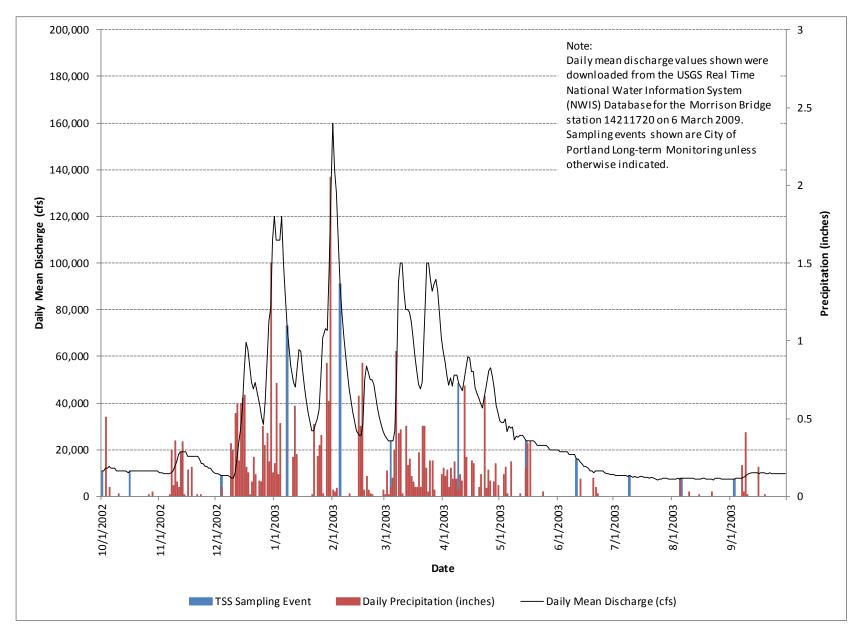


Figure 3.1-24c
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2003

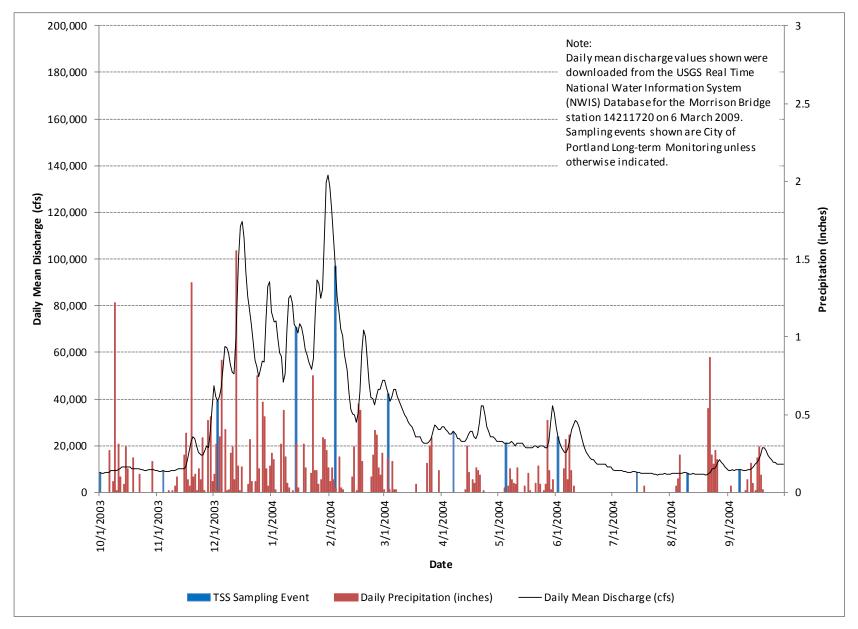


Figure 3.1-24d
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2004

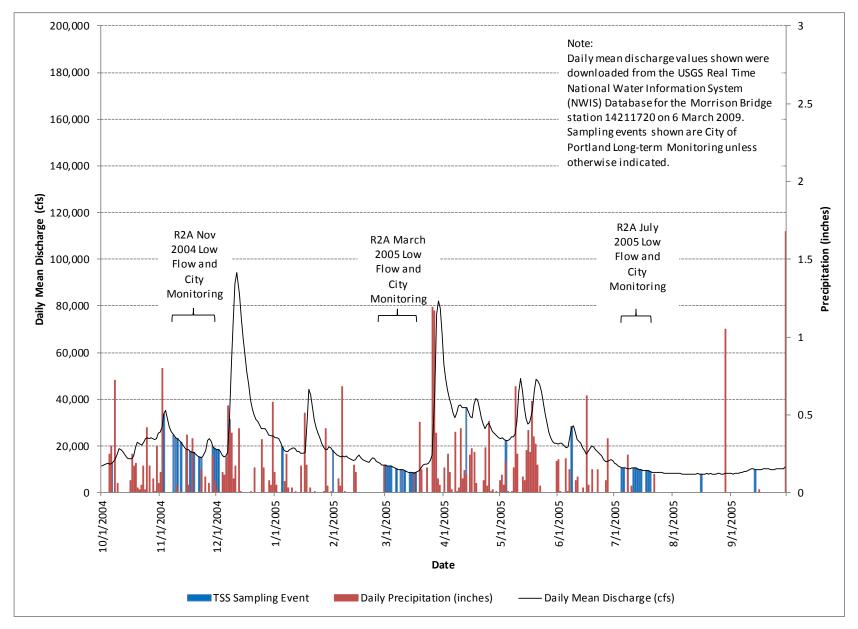


Figure 3.1-24e
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2005

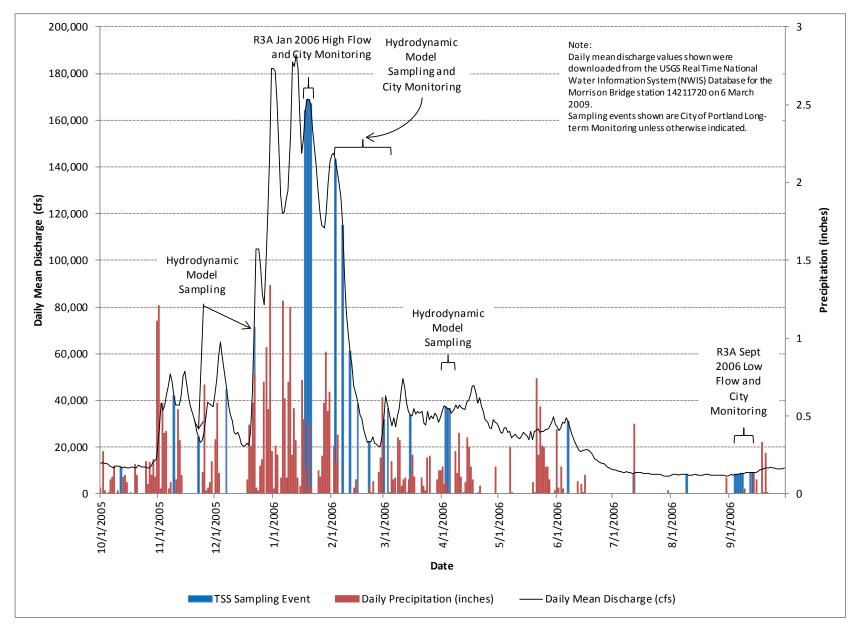


Figure 3.1-24f
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2006

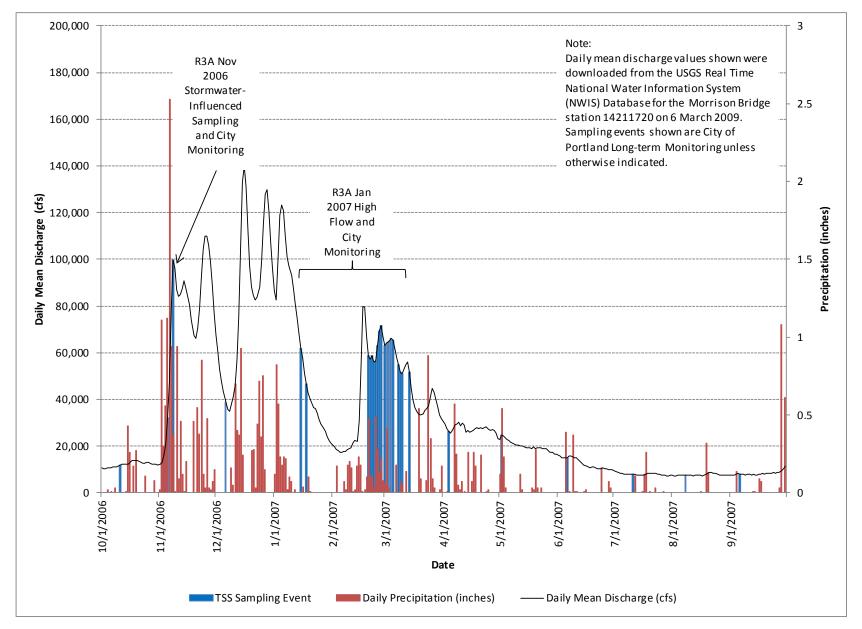


Figure 3.1-24g
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2007

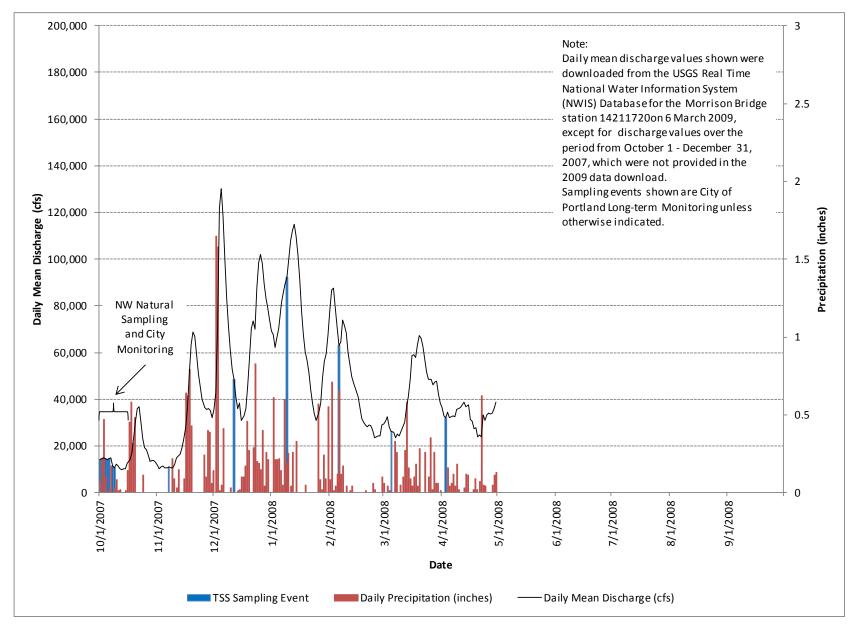


Figure 3.1-24h
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph, Precipitation, and
TSS Sampling Events, Water Year 2008

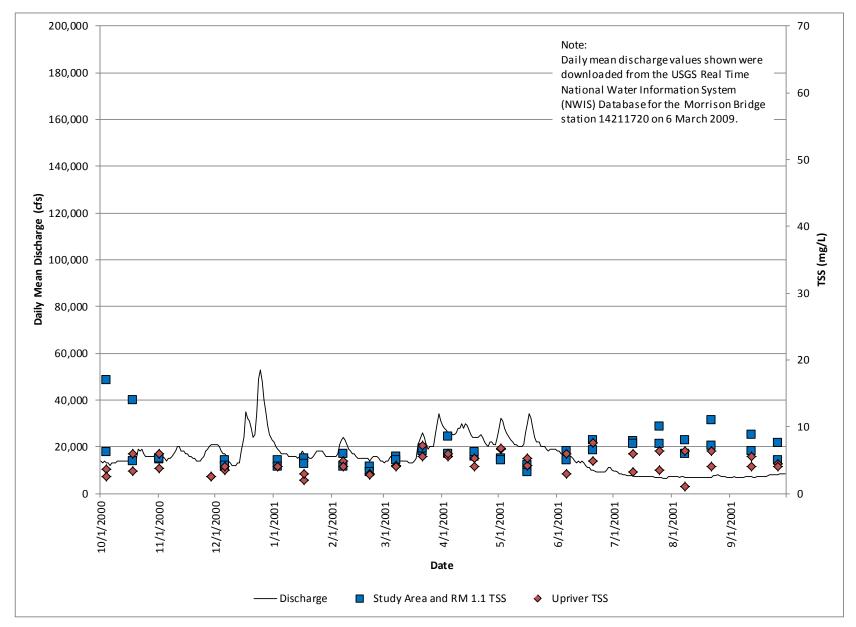


Figure 3.1-25a
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2001

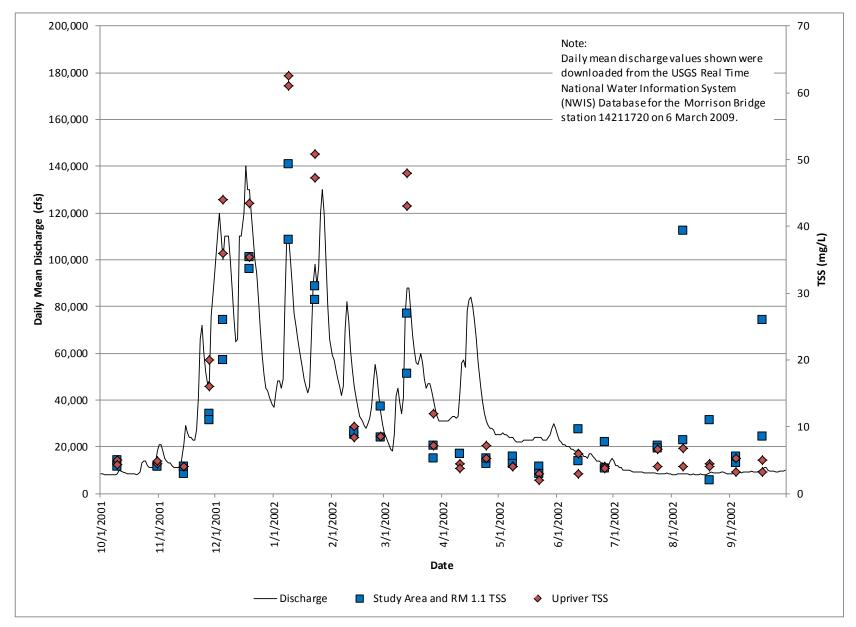


Figure 3.1-25b
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2002

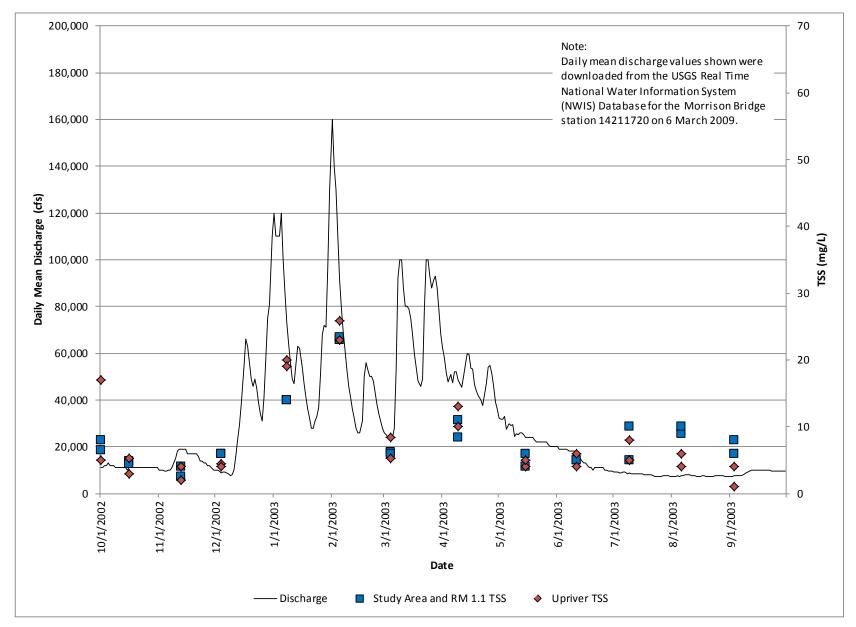


Figure 3.1-25c
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2003

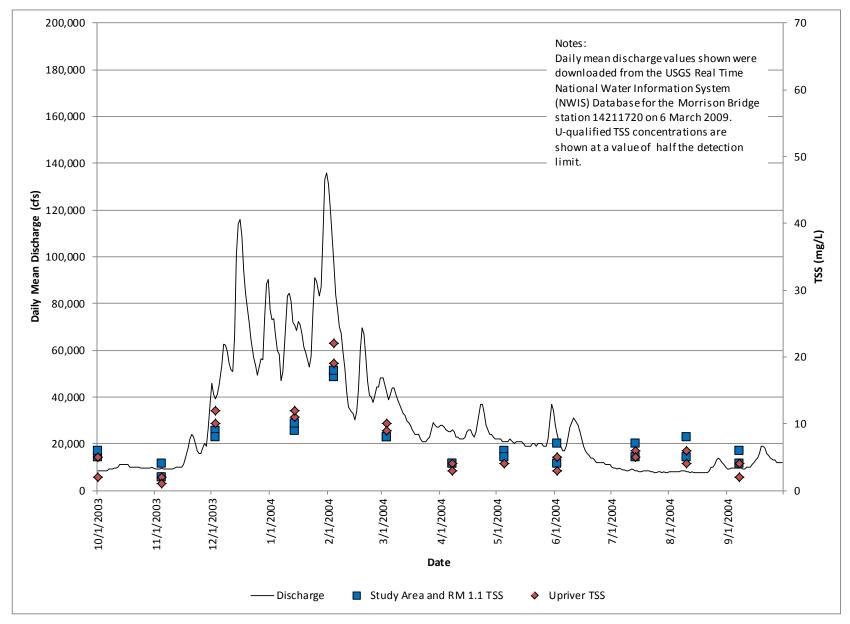


Figure 3.1-25d
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2004

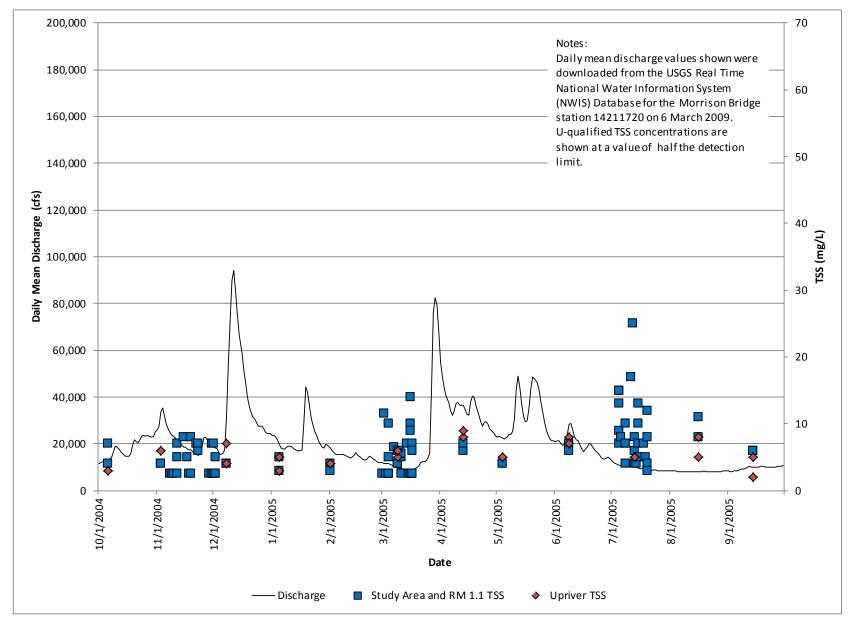


Figure 3.1-25e
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2005

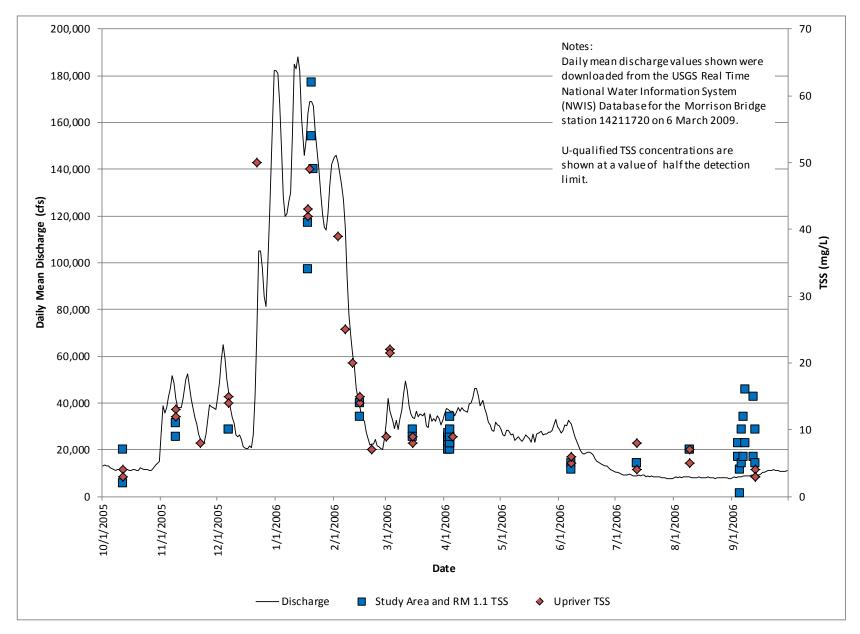


Figure 3.1-25f
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2006

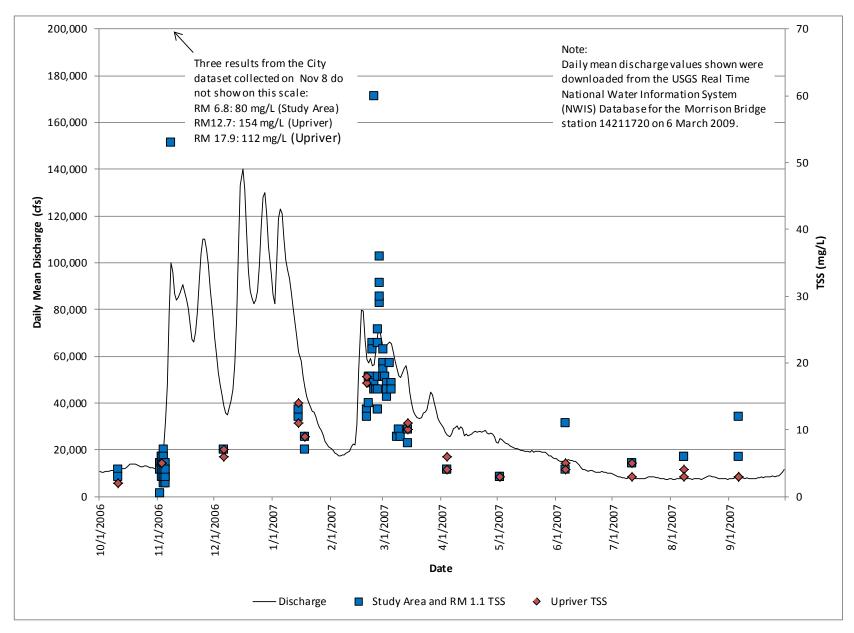


Figure 3.1-25g
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2007

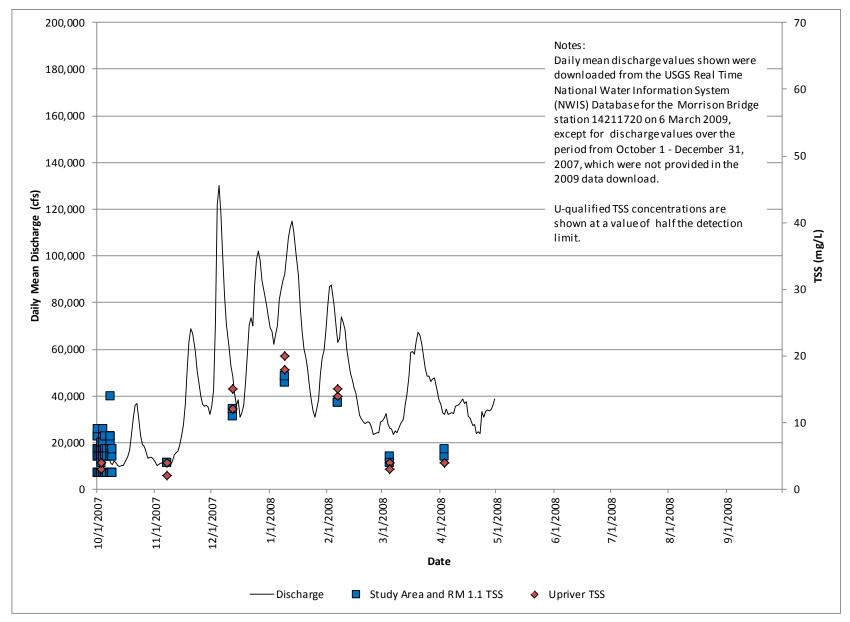


Figure 3.1-25h
Portland Harbor RI/FS
Remedial Investigation Report
Discharge Hydrograph and TSS Results,
Water Year 2008

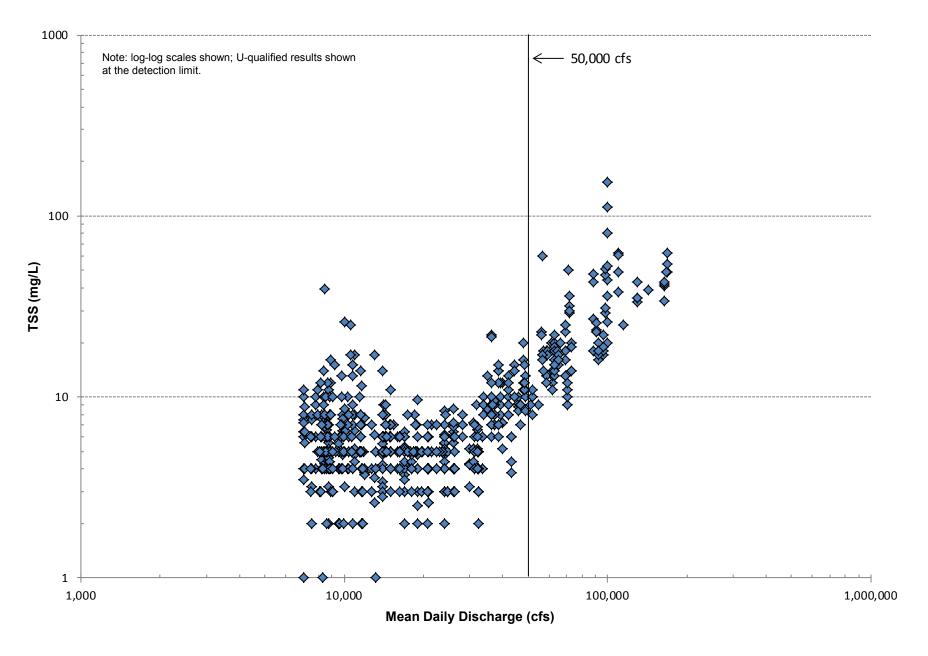


Figure 3.1-26
Portland Harbor RI/FS
Remedial Investigation Report
TSS vs. Discharge – All Data

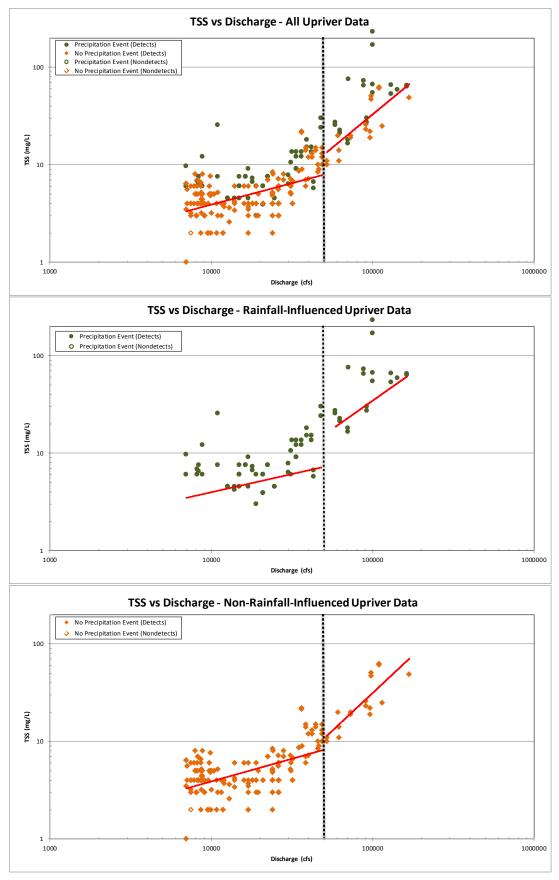


Figure 3.1-27
Portland Harbor RI/FS
Remedial Investigation Report
TSS vs. Discharge – Upriver Data

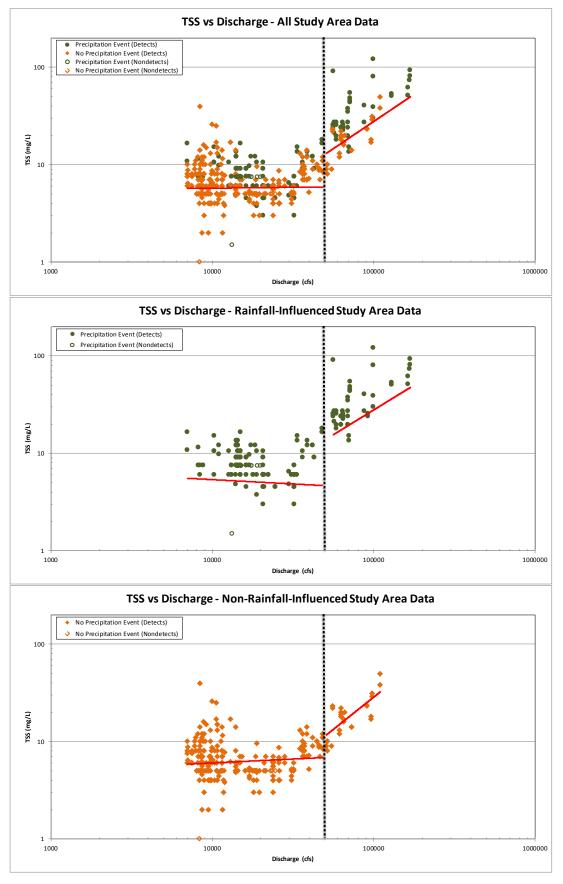


Figure 3.1-28
Portland Harbor RI/FS
Remedial Investigation Report
TSS vs. Discharge – Study Area Data

LISST Suspended Particle Size Measurements with Depth

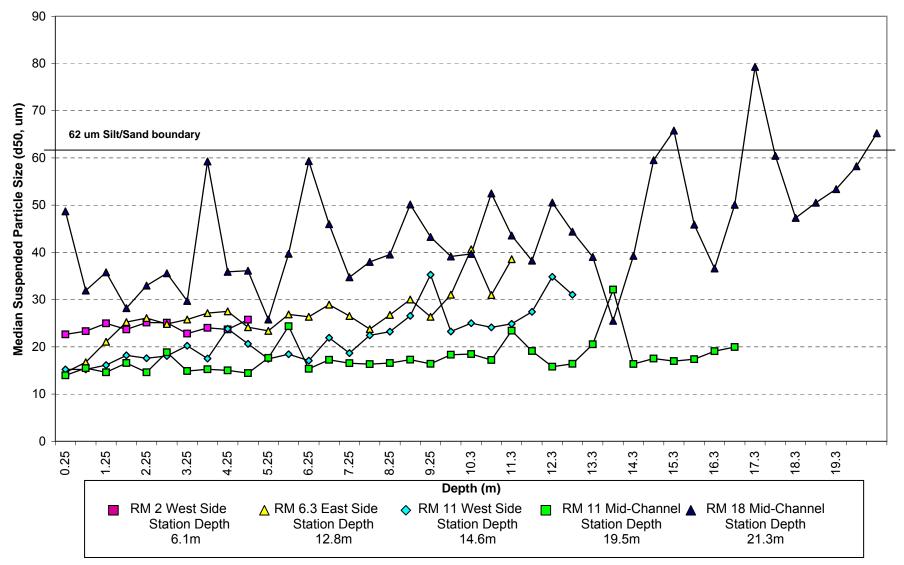


Figure 3.1-29
Portland Harbor RI/FS
Remedial Investigation Report
LISST Suspended Particle Size
Measurements with Depth

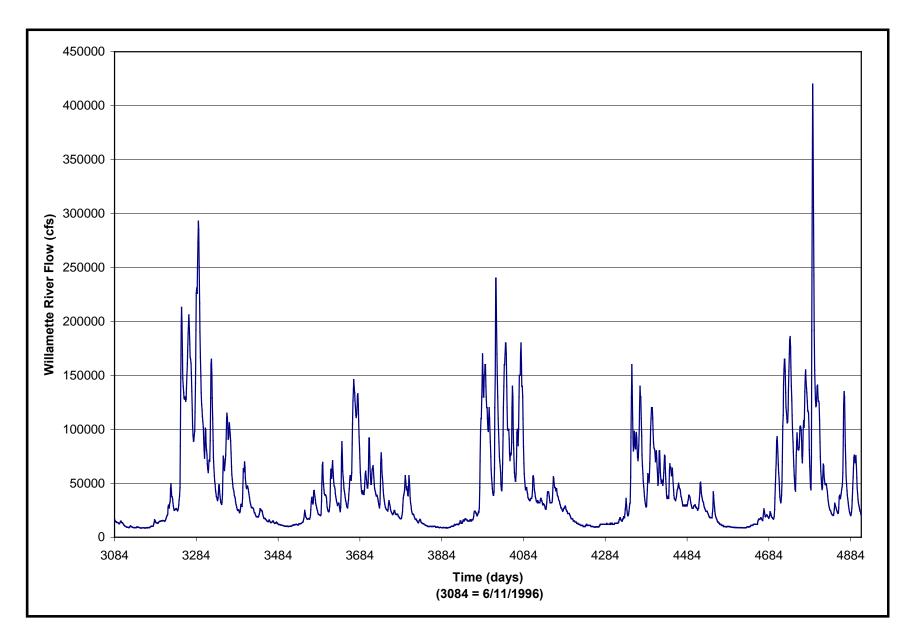
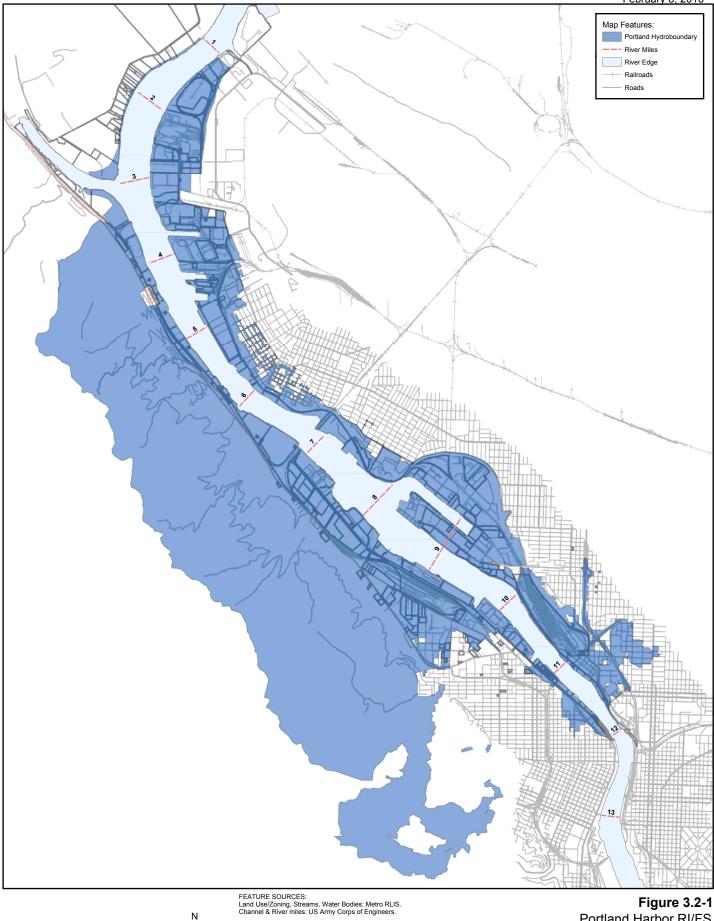


Figure 3.1-30
Portland Harbor RI/FS
Remedial Investigation Report
Five-year High-flow Flood Scenario Hydrograph



3,000

6,000 Feet

Portland Harbor RI/FS
Remedial Investigation Report
Stormwater Basin Hydroboundary
River Miles 1-11.8

Portland Harbor RI/FS

Remedial Investigation Report Types of Conveyance Systems

TYPES OF CONVEYANCE SYSTEMS Treatment 1 - Separated System Treatment PLANT 2 - Combined System to Plant Wastewater Treatment PLANT **3 - Combined Sewer Overflow Diverter** Stormwater only Sanitary Only Combined **Figure 3.2-2** Interceptor

CSO Diversion

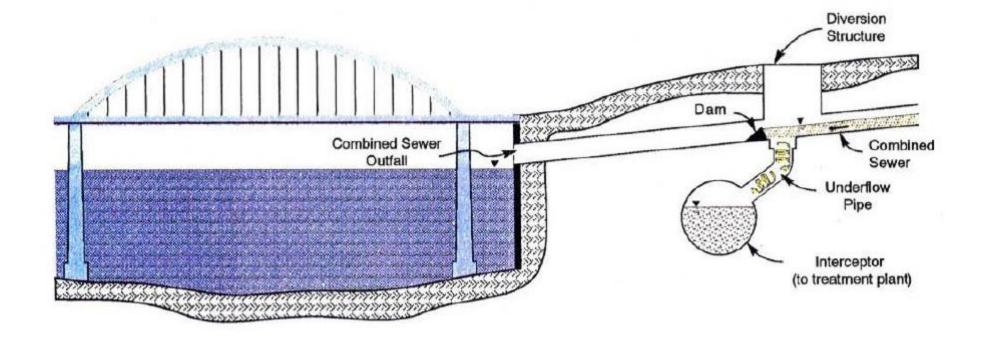


Figure 3.2-3
Portland Harbor RI/FS
Remedial Investigation Report
CSO Design

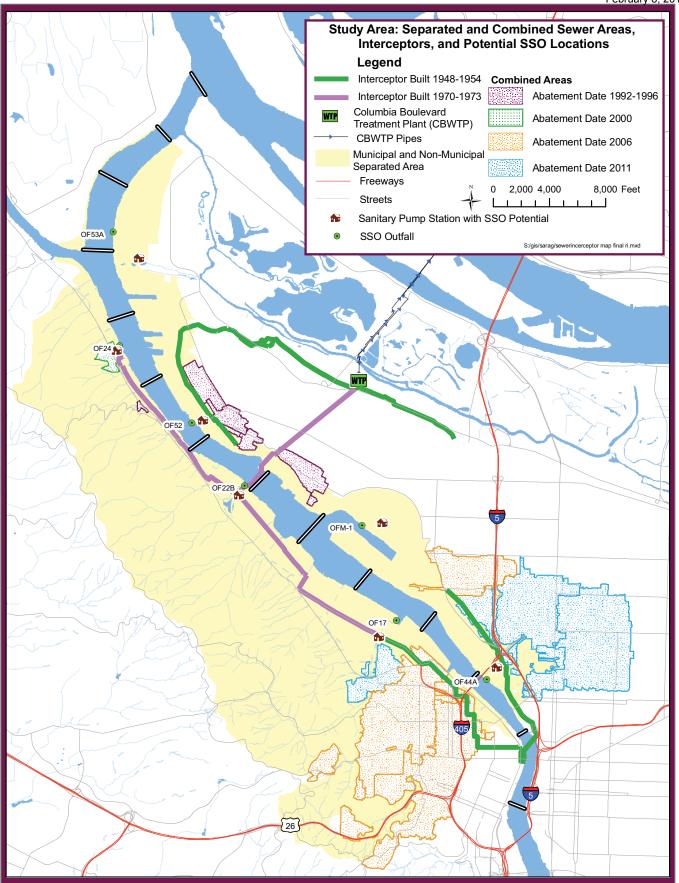


Figure 3.2-4
Portland Harbor RI/FS
Remedial Investigation Report
Separate and Combined Sewer Systems and
Interceptor Facilities and Potential SSO Locations

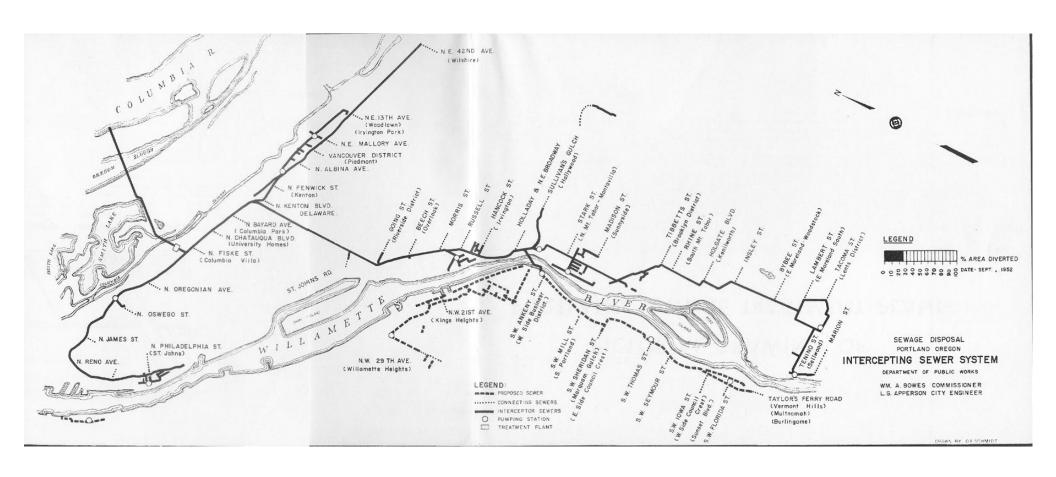


Figure 3.2-5
Portland Harbor RI/FS
Remedial Investigation Report
Intercepting Sewer System - 1952

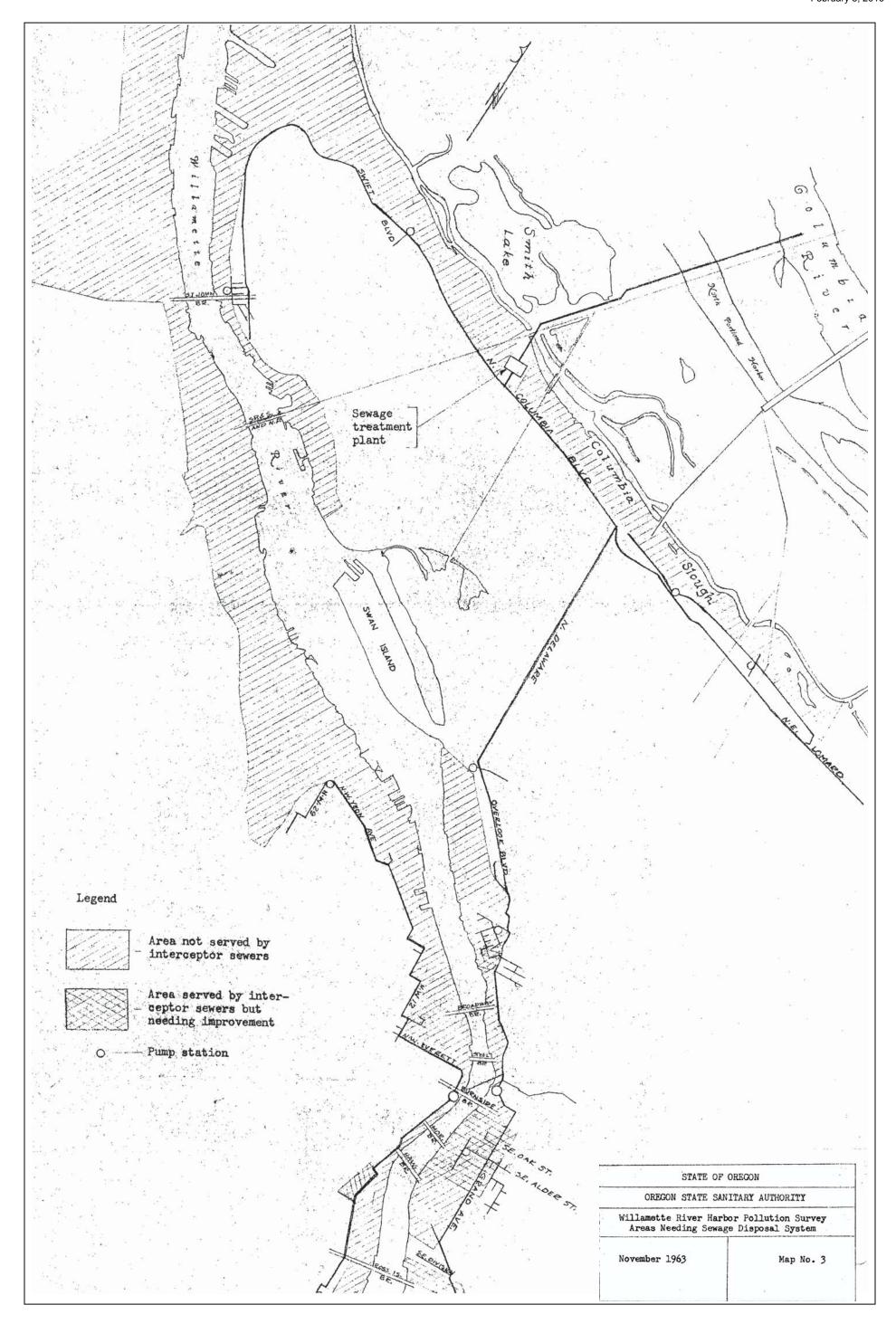


Figure 3.2-6
Portland Harbor RI/FS
Remedial Investigation Report
Willamette River Harbor Pollution Survey Areas
Needing Sewage Disposal System (OSSA 1963)

KINDS AND SOURCES OF POLLUTION PROBLEMS NORTHWEST REGION

KIND OF PROBLEM

SOURCE OF PROBLEM		Oxygen dfcy.	Turbi- dity	Sedi- ments	Enrich- ment	Bacteria	Toxics	pН	Heat	TDS
MUNICIPAL	Municipal Wastes	XXX			XXX					
THE THE	Urban runoff									
MANUFAC- TURING	Primary metal Canning & Frzg. Steam power	,	XXX	XXX						
			XXX	XXX	XXX					
									XXX	
	Pulp & Paper		XXX				XXX	XXX		
	Lumber		XXX	XXX	XXX		XXX			
	Trsptn. Eqpt.		<u> </u>					XXX	XXX	
	Chemicals			- 0000				XXX		
AGRICULTURE	Irrigation				XXX					
	Farm Animals		XXX		XXX					
	Cropland erosion				XXX					
	Pesticides						XXX			33
	Logging		XXX	XXX						
MINING	Heavy Metals									
	Acid									
	Solids									
OTHER	Spills & Vessels Natural Drainage Reservoir Mngt. Dredging	(XXX	0111111			CXXX				
					шш					
			шш							

= light impairment: limited both in time and in area, contributory to some larger source of

= no control problem, or the source of a potential problem

Note: Table reproduced from DOI 1968 (Table 4).

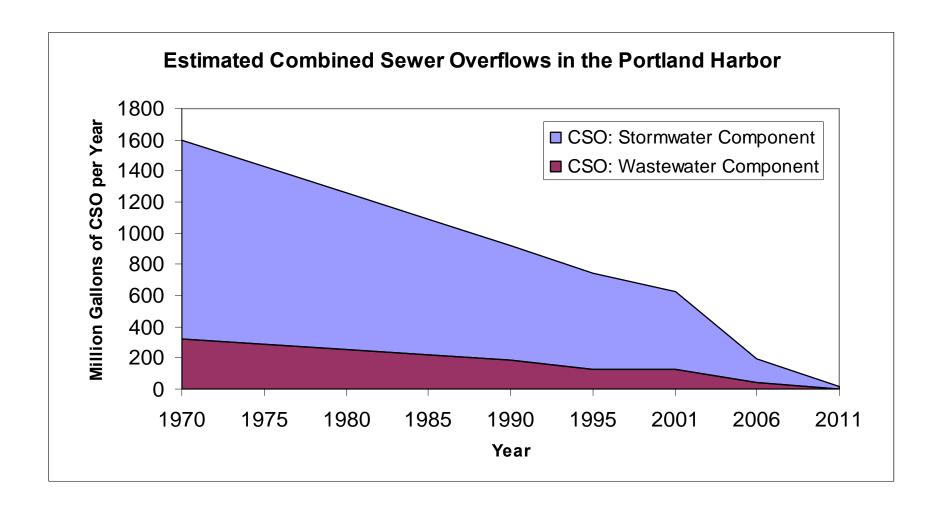
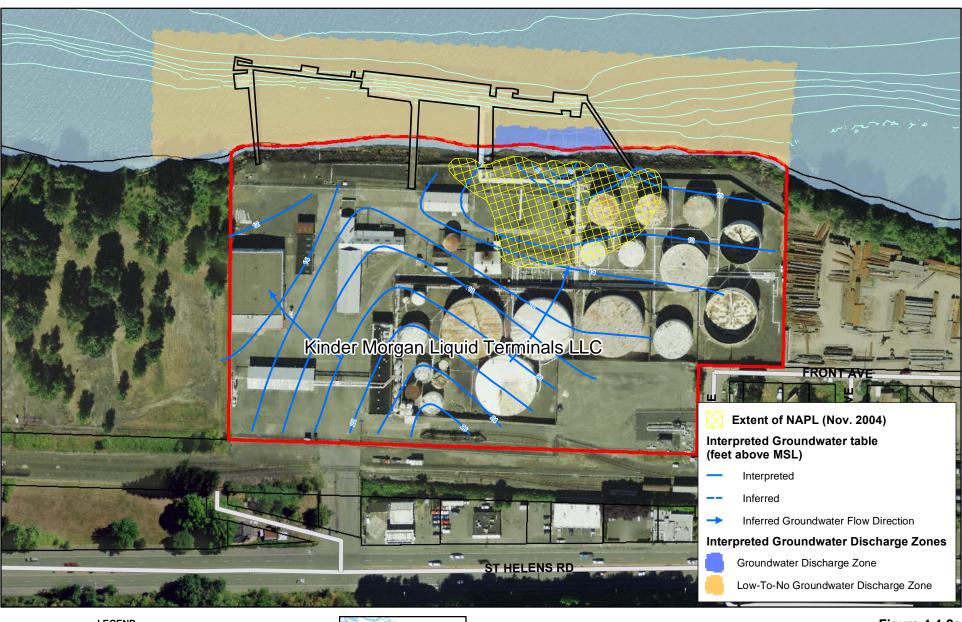


Figure 4.4-1
Portland Harbor RI/FS
Remedial Investigation Report
Estimated Combined Sewer Overflows
in the Portland Harbor



LEGEND

2003 Bathymetric 5 Ft. Contours (NAVD 88)

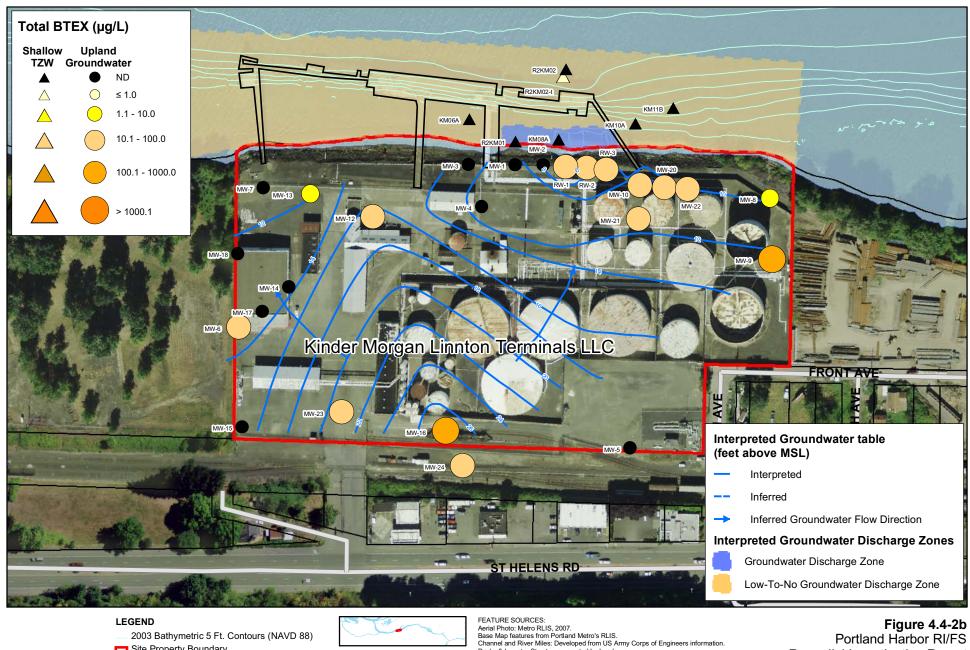
Site Property Boundary





FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft resolution color orthophotos.
Groundwater Mel Date: Locations are approximate and drawn from Delta. 2005a.
Groundwater Mentioning Project Status Update Report, Third Quarter 2004,
Knder Morgan Liquid Terminals, LLC, Limbol Terminal, Potitand / Oregon. January 11, 2005.

Figure 4.4-2a Portland Harbor RI/FS Remedial Investigation Report Kinder Morgan Linnton Site Distribution of NAPL in Upland Groundwater



2003 Bathymetric 5 Ft. Contours (NAVD 88) Site Property Boundary

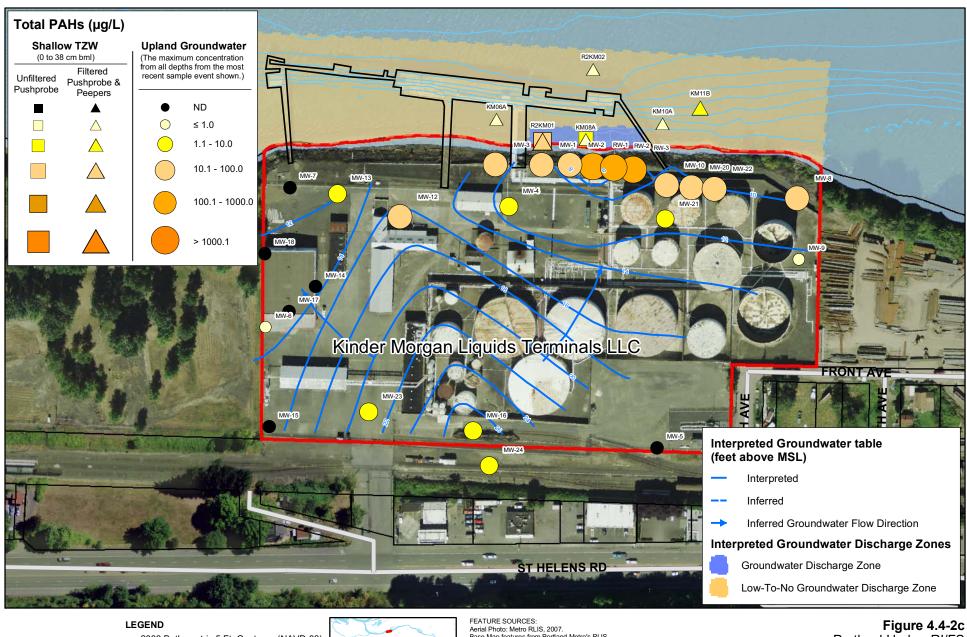




Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater Well Data: locations are approximate and drawn from Delta. 2005a.

Groundwater Monitoring/Project Status Update Report, Third Quarter 2004, Kinder Morgan Liquid Terminals, LLC, Linnton Terminal, Portland, Oregon. January 11, 2005.

Portland Harbor RI/FS Remedial Investigation Report Kinder Morgan Linnton Site Total BTEX in Upland Groundwater and Shallow TZW



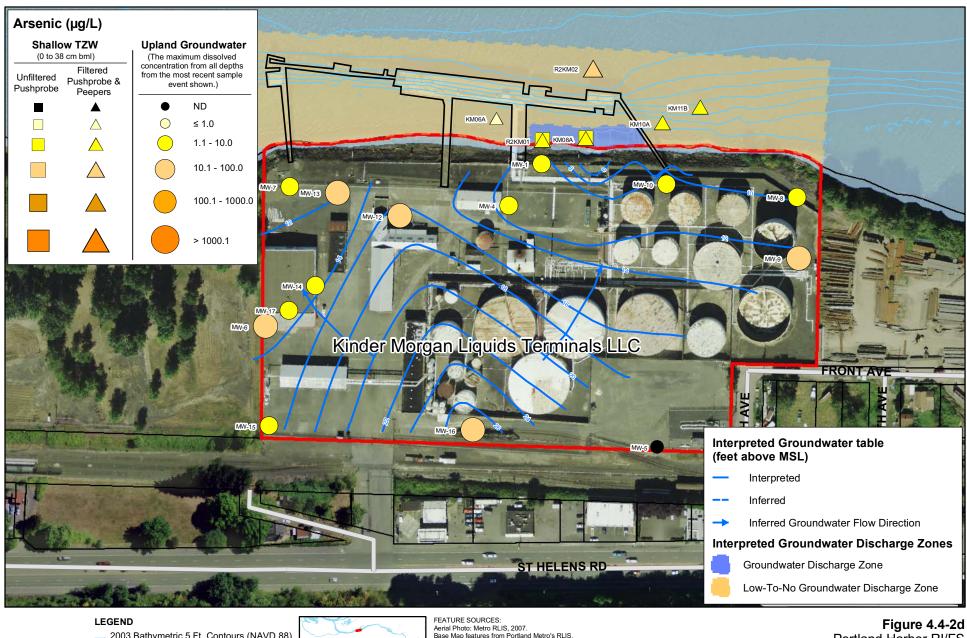
2003 Bathymetric 5 Ft. Contours (NAVD 88)

☐ Site Property Boundary

0 50 100
☐ Foot

Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.38 ft. resolution color orthophotos.
Groundwater Well Data: locations are approximate and drawn from Delta. 2005a.
Groundwater Monitoring/Project Status Update Report, Third Quarter 2004,
Kinder Morgan Liquid Terminals, LLC, Linnton Terminal, Portland, Oregon. January 11, 2005.

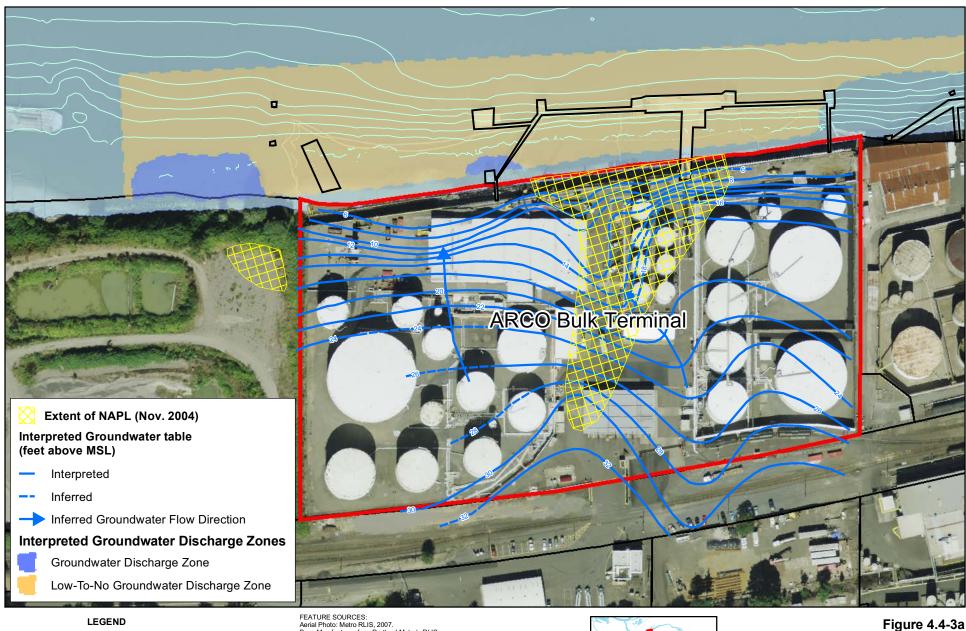
Figure 4.4-2c
Portland Harbor RI/FS
Remedial Investigation Report
Kinder Morgan Linnton Site
Total PAHs in Upland Groundwater
and Shallow TZW



LEGEND 2003 Bathymetric 5 Ft. Contours (NAVD 88) Site Property Boundary 0 50 100

Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.
Groundwater Well Data: locations are approximate and drawn from Delta. 2005a.
Groundwater Monitoring/Project Status Update Report, Third Quarter 2004,
Kinder Morgan Liquid Terminals, LLC, Linnton Terminal, Portland, Oregon. January 11, 2005.

Figure 4.4-2d
Portland Harbor RI/FS
Remedial Investigation Report
Kinder Morgan Linnton Site
Arsenic in Upland Groundwater
and Shallow TZW



Site Property Boundary

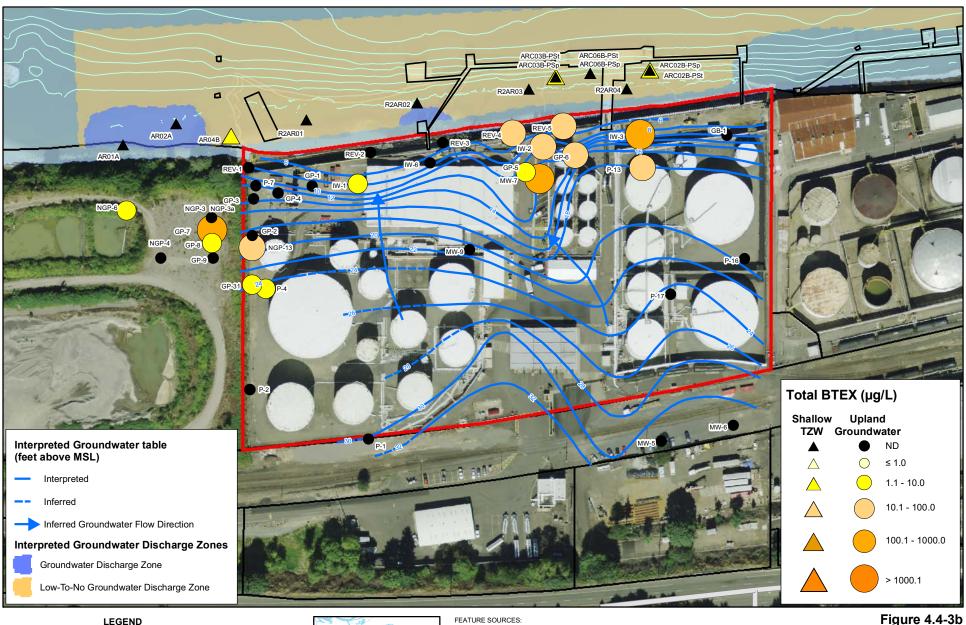


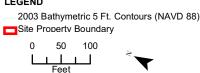
FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Cross-Sections: Locations are approximate and drawn by measuring from Figure 2-2 (SECOR 2004).
Wells & Remediation Systems: Remediation System Outline (ft) is approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Groundwater Contours: Interpreted Groundwater Table Contours (ft) are approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Figure 4.4-3a
Portland Harbor RI/FS
Remedial Investigation Report
ARCO Site
Distribution of NAPL in Upland Groundwater





FEATURE SOURCES: Aerial Photo: Metro RLIS, 2007. Renal Findo. Medic Acts, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.

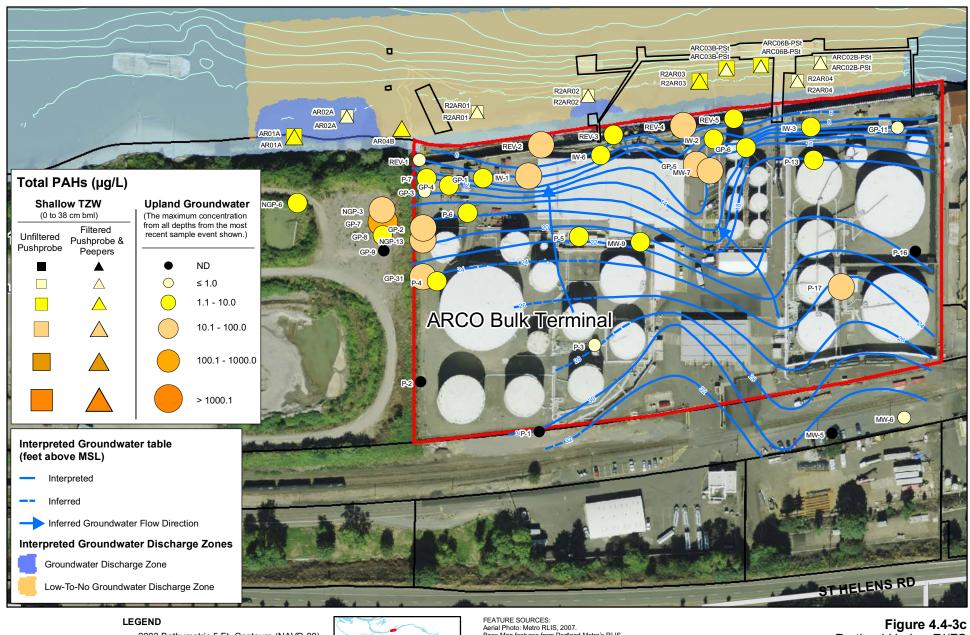
resolution color orthophotos. Cross-Sections: Locations are approximate and drawn by measuring from

Figure 2-2 (SECOR 2004).

Wells & Remediation Systems: Remediation System Outline (ft) is approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Groundwater Contours: Interpreted Groundwater Table Contours (ft) are approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Figure 4.4-3b Portland Harbor RI/FS Remedial Investigation Report ARCO Site Total BTEX in Upland Groundwater and Shallow TZW



Site Property Boundary



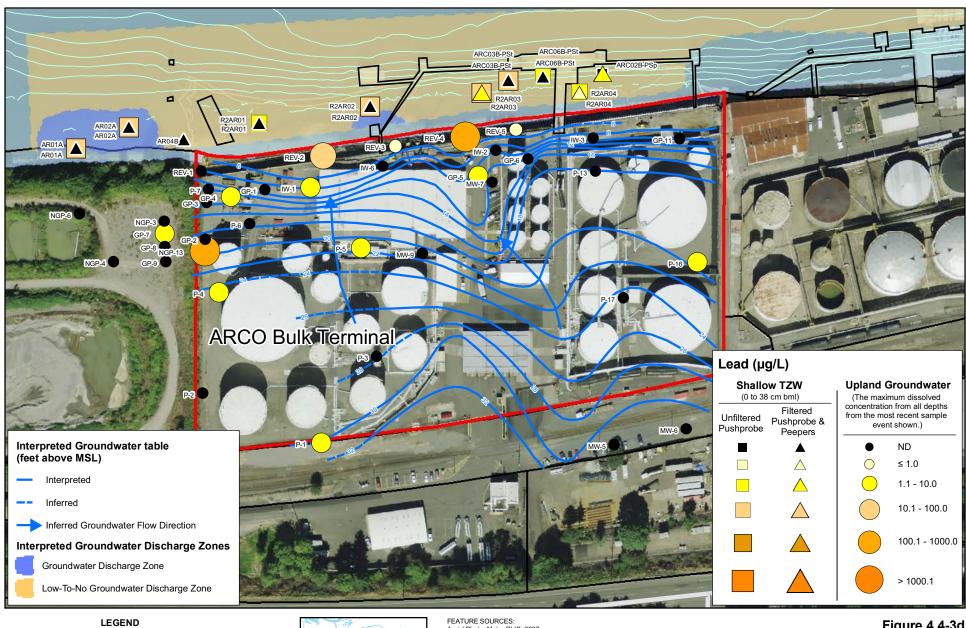
Base Map features from Portland Metro's RLIS.

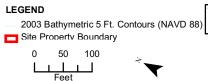
Channel and River Miles: Developed from US Army Corps of Engineers information. Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Cross-Sections: Locations are approximate and drawn by measuring from Figure 2-2 (SECOR 2004).

Wells & Remediation Systems: Remediation System Outline (ft) is approximate; traced from original figures created by URS (May 27, 2004 & March 2004). Groundwater Contours: Interpreted Groundwater Table Contours (ft) are approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Portland Harbor RI/FS Remedial Investigation Report ARCO Site Total PAHs in Upland Groundwater and Shallow TZW

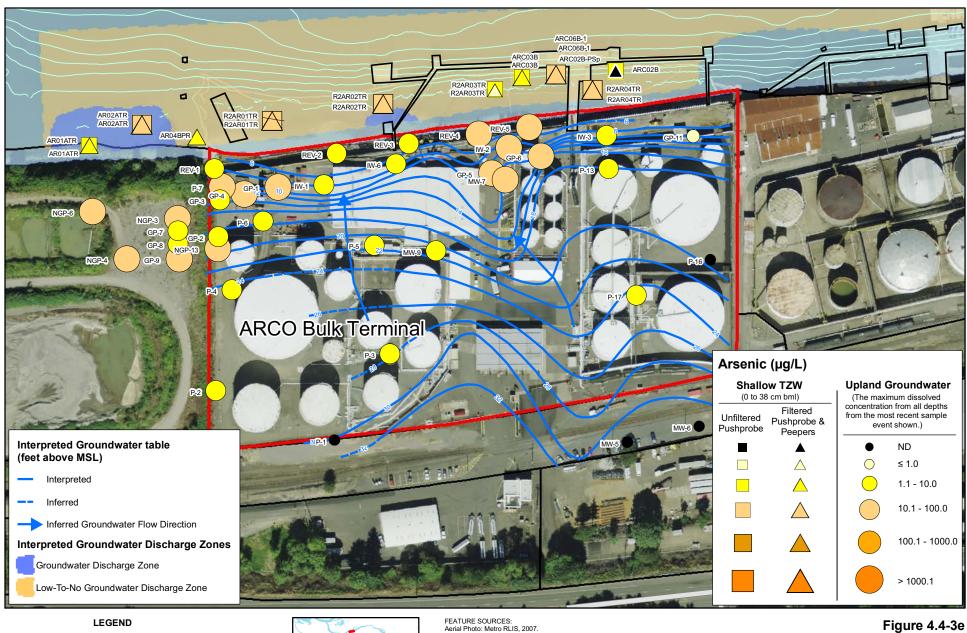


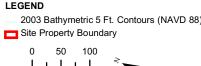


FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.
Cross-Sections: Locations are approximate and drawn by measuring from

Figure 2-2 (SECOR 2004). Wells & Remediation System Outline (ft) is approximate; traced from original figures created by URS (May 27, 2004 & March 2004). Groundwater Contours: Interpreted Groundwater Table Contours (ft) are approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Figure 4.4-3d
Portland Harbor RI/FS
Remedial Investigation Report
ARCO Site
Lead in Upland Groundwater
and Shallow TZW





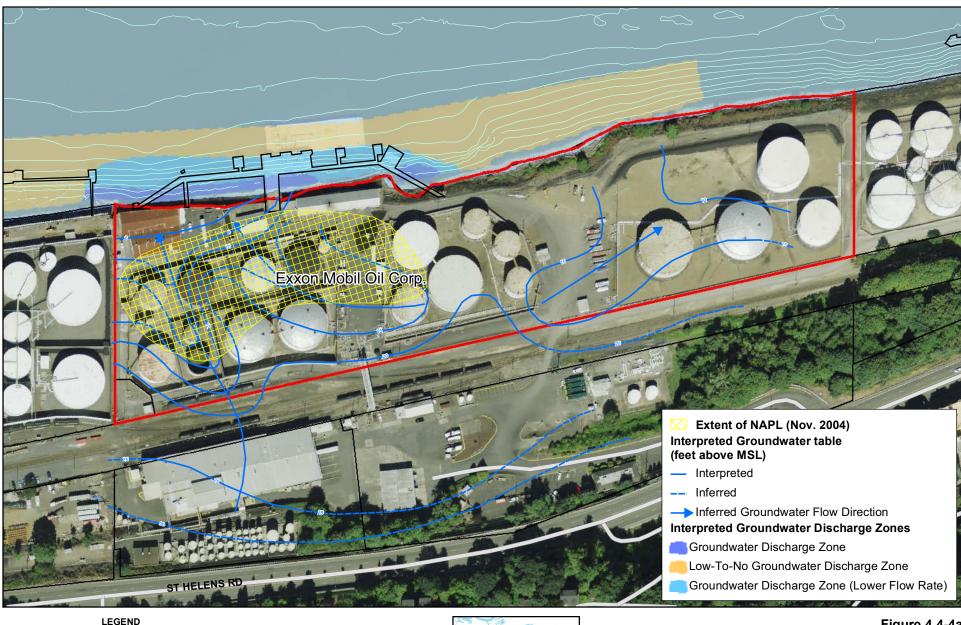
FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of

Channel and River Miles: Developed from US Army Corps of Engineers information.

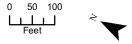
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Cross-Sections: Locations are approximate and drawn by measuring from Figure 2-2 (SECOR 2004). Wells & Remediation Systems: Remediation System Outline (ft) is approximate; traced from original figures created by URS (May 27, 2004 & March 2004). Groundwater Contours: Interpreted Groundwater Table Contours (ft) are approximate; traced from original figures created by URS (May 27, 2004 & March 2004).

Figure 4.4-3e
Portland Harbor RI/FS
Remedial Investigation Report
ARCO Site
Arsenic in Upland Groundwater
and Shallow TZW



Site Property Boundary



□FEATURE SOURCES: Aerial Photo: Metro RLIS, 2007.

Renal Fritou. Weet Nation 2007.

Base Map features from Portland Metro's RLIS.

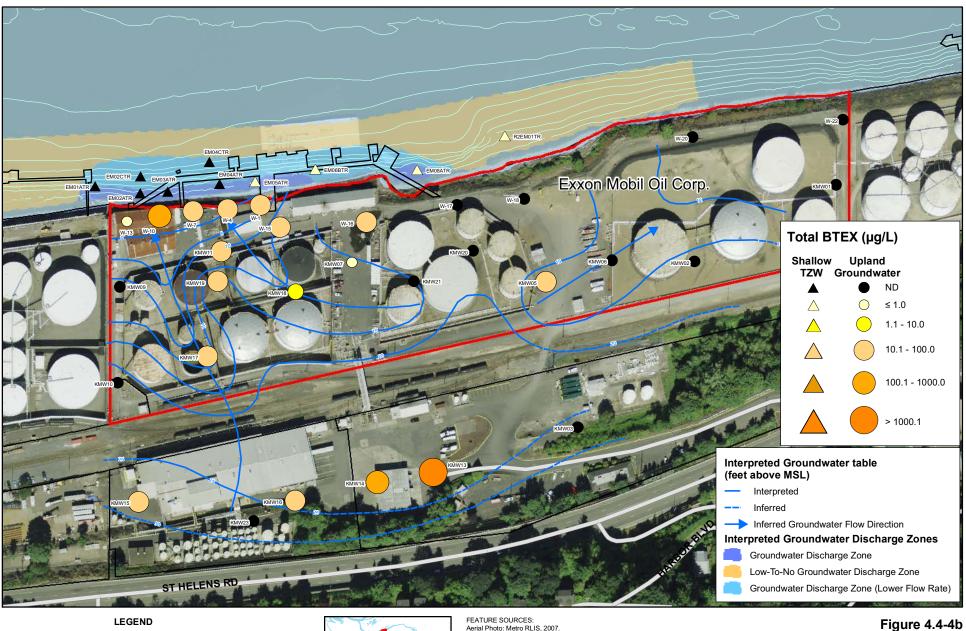
Channel and River Miles: Developed from US Array Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.

resolution color orthophotos. resonation cond originations:
Groundwater Contour: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).
Wells & Remediation System: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).

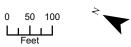
Figure 4.4-4a Portland Harbor RI/FS Remedial Investigation Report ExxonMobil Site

Distribution of NAPL in Upland Groundwater and TZW



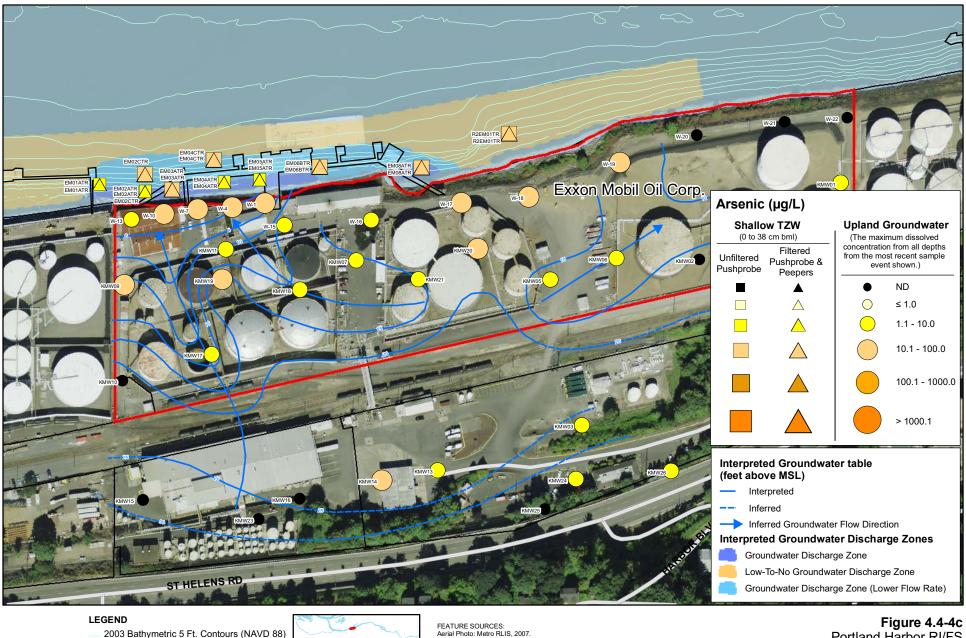
___ 2003 Bathymetric 5 Ft. Contours (NAVD 88)

Site Property Boundary



FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.
resolution color orthophotos.
Groundwater Contour: locations are approximate and drawn by
measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).
Wells & Remediation System: locations are approximate and drawn by
measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).

Figure 4.4-4b
Portland Harbor RI/FS
Remedial Investigation Report
ExxonMobil Site
Total BTEX in Upland Groundwater
and Shallow TZW



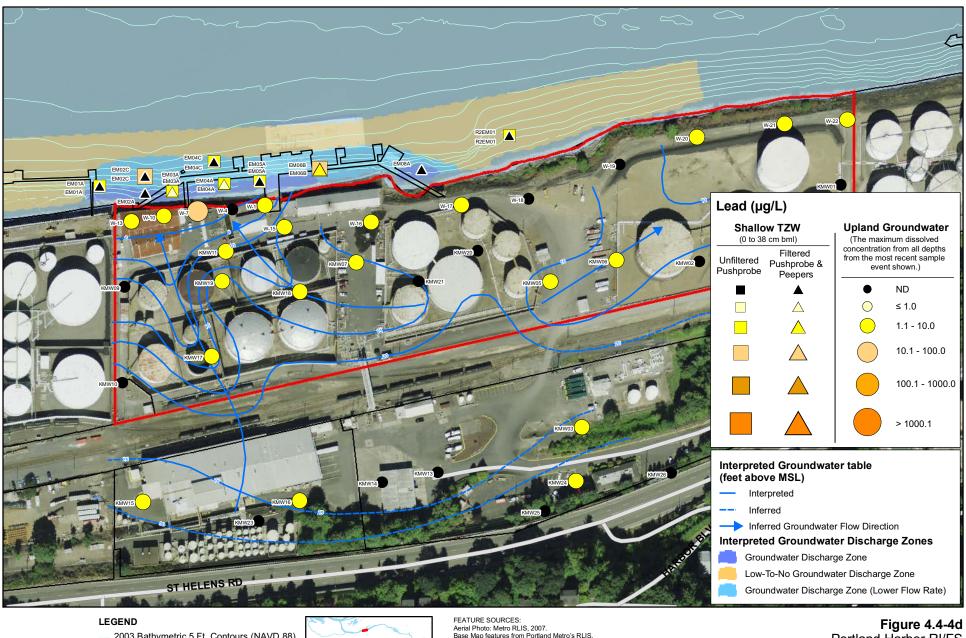
Site Property Boundary



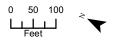
FEATURE SOURCES: Aerial Photo: Metro RLIS, 2007. Base Map features from Portland Metro's RLIS. Channel and River Miles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater Contour: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).
Wells & Remediation System: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).

Portland Harbor RI/FS Remedial Investigation Report ExxonMobil Site Arsenic in Upland Groundwater and Shallow TZW



Site Property Boundary



Benair Findo, weeto KLIS, 2007.

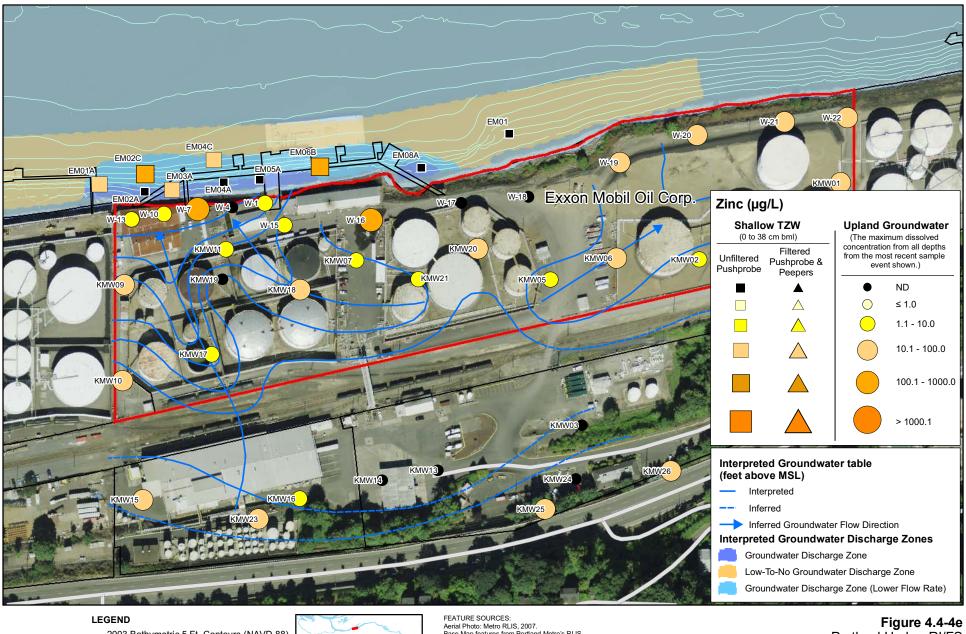
Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

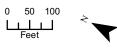
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

resonation cond originations:
Groundwater Contour: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).
Wells & Remediation System: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).

Figure 4.4-4d Portland Harbor RI/FS Remedial Investigation Report ExxonMobil Site Lead in Upland Groundwater and Shallow TZW



Site Property Boundary



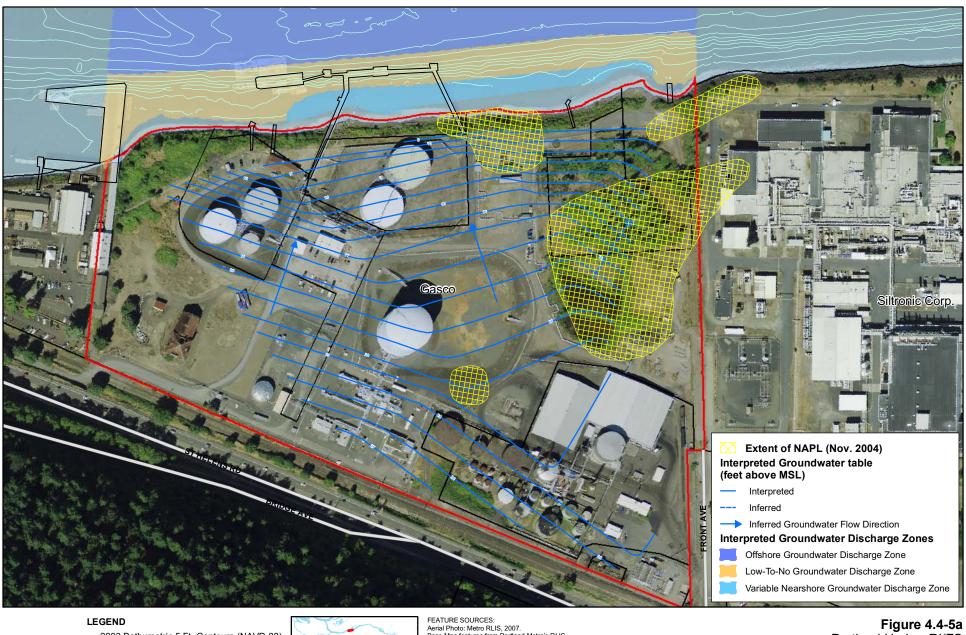
Aerial Fridou, Web O ALLS, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater Contour: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002). Wells & Remediation System: locations are approximate and drawn by measuring from Figure 3 (Kleinfelder, Oct. 14, 2002).

Portland Harbor RI/FS Remedial Investigation Report ExxonMobil Site Zinc in Upland Groundwater and Shallow TZW



Site Property Boundary





Aerial Proto: Metro KLIS, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Wells, Groundwater Contours and Remediation Systems: Locations are approximate and drawn from IHAI (2005). Report on Supplemental Upland Remedial Investigation Activities, 7900 NW St. Helens Road, Portland, Oregon. Hahn and Associates, Inc., March 11, 2005.

Figure 4.4-5a Portland Harbor RI/FS Remedial Investigation Report Gasco Site Distribution of NAPL in Upland Groundwater

Gasco Site



Site Property Boundary

0 100 200

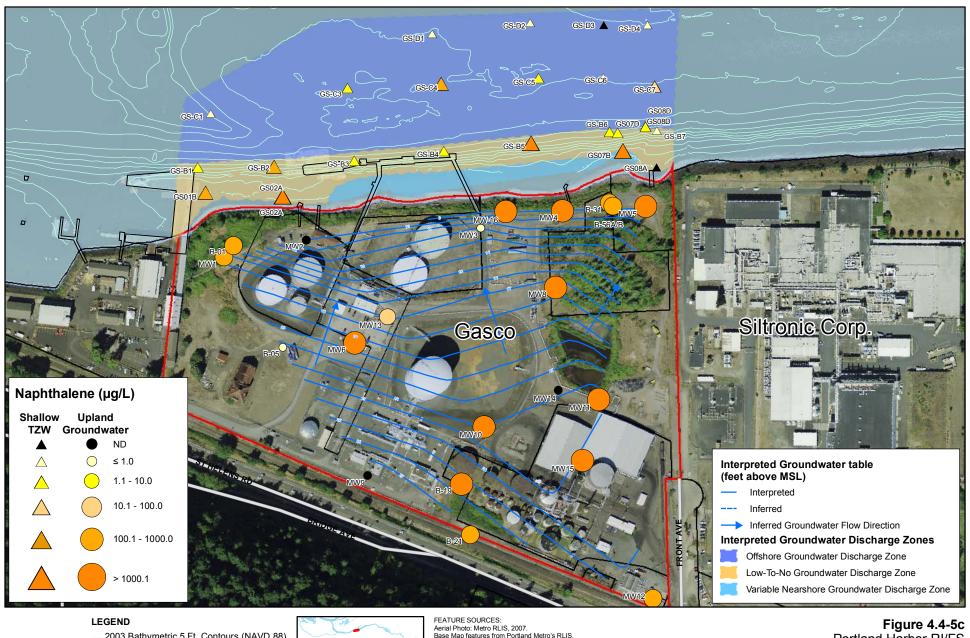
Feet

Rental Floto: weeto RLOS, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Milles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. Remedial Investigation Report Wells, Groundwater Contours and Remediation Systems: Locations are approximate and drawn from IHAI (2005). Report on Supplemental Upland Remedial Investigation Activities, 7900 NW St. Helens Road, Portland, Oregon. Hahn and Associates, Inc., March 11, 2005. Total BTEX in Upland Groundwater and Shallow TZW



Site Property Boundary

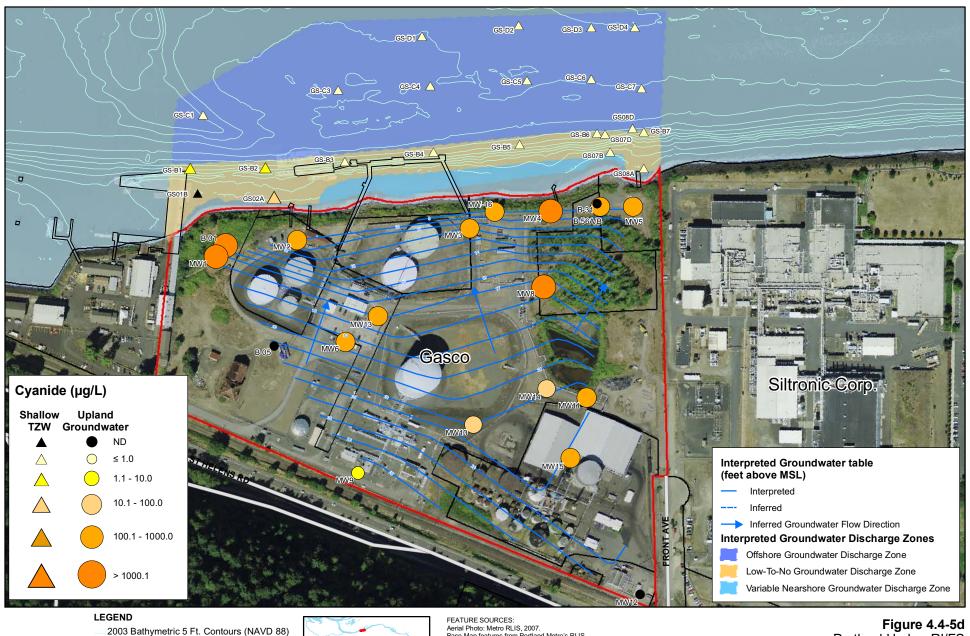




Base Map features from Portland Metro's RLIS.
Channel and River Milles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.

Wells, Groundwater Contours and Remediation Systems: Locations are approximate and drawn from IHAI (2005). Report on Supplemental Upland Remedial Investigation Activities, 7900 NW St. Helens Road, Portland, Oregon. Hahn and Associates, Inc., March 11, 2005.

Figure 4.4-5c Portland Harbor RI/FS Remedial Investigation Report Gasco Site Naphthalene in Upland Groundwater and Shallow TZW



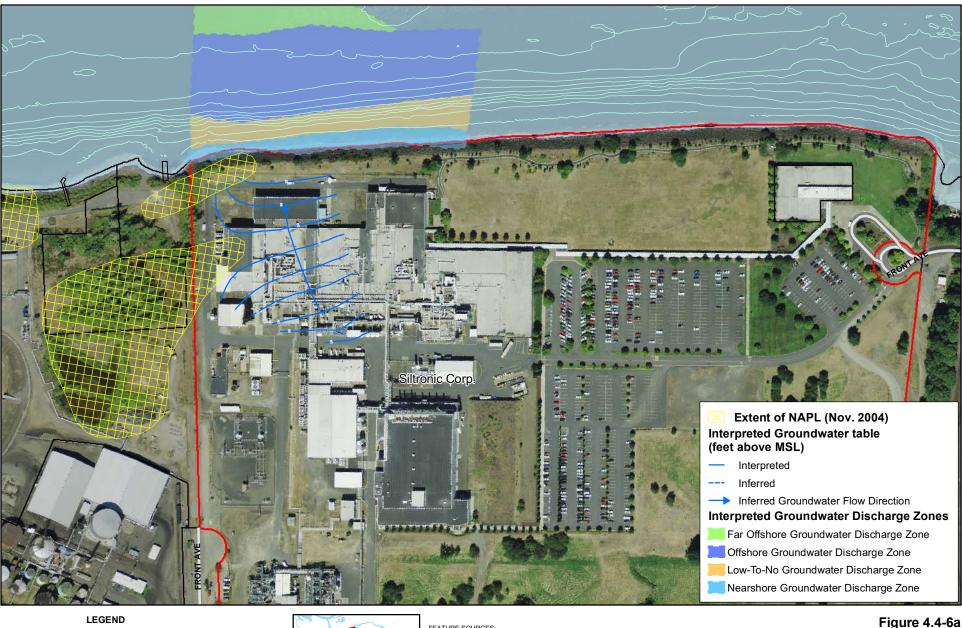
Site Property Boundary



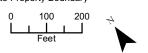
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Wells, Groundwater Contours and Remediation Systems: Locations are approximate and drawn from IHAI (2005). Report on Supplemental Upland Remedial Investigation Activities, 7900 NW St. Helens Road, Portland, Oregon. Hahn and Associates, Inc., March 11, 2005.

Figure 4.4-5d Portland Harbor RI/FS Remedial Investigation Report Gasco Site Total Cyanide in Upland Groundwater and Shallow TZW



Site Property Boundary



FEATURE SOURCES: Aerial Photo: Metro RLIS, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

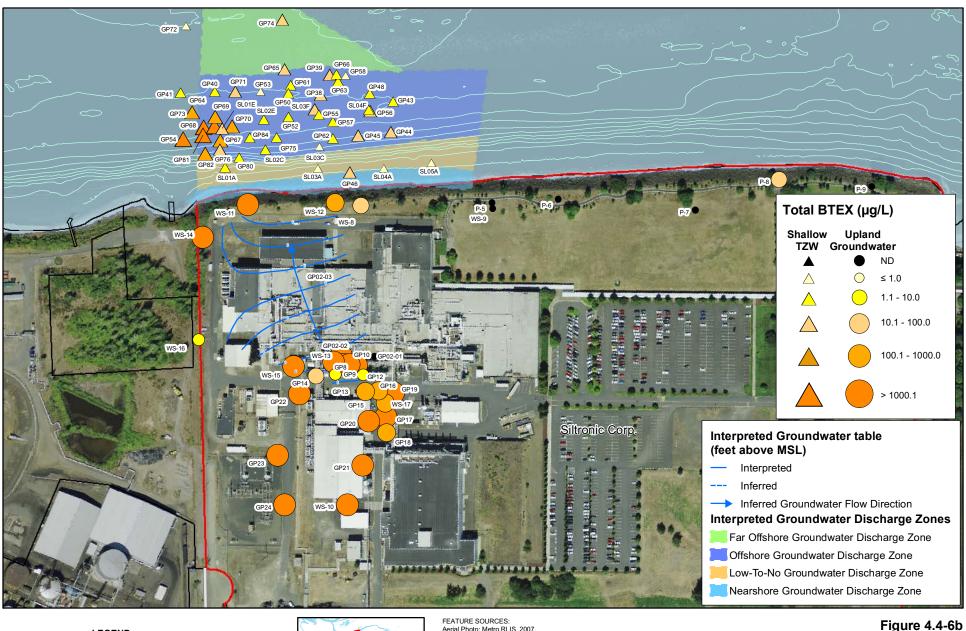
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Nells & Groundwater Contours: Locations are approximate and drawn from MFA, 2004.

Remedial Investigation Proposal, Siltronic Corporation Site,
7200 NW Front Avenue, Portland, Oregon 97210, Maul Foster & Alongi, Inc. April 2.

Figure 4.4-6a Portland Harbor RI/FS Remedial Investigation Report Siltronic Site

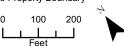
Distribution of NAPL in Upland Groundwater



LEGEND

2003 Bathymetric 5 Ft. Contours (NAVD 88)

Site Property Boundary



Aerial Photo: Metro RLIS, 2007. Renial Fritiou. Weet NLCs, 2007.

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

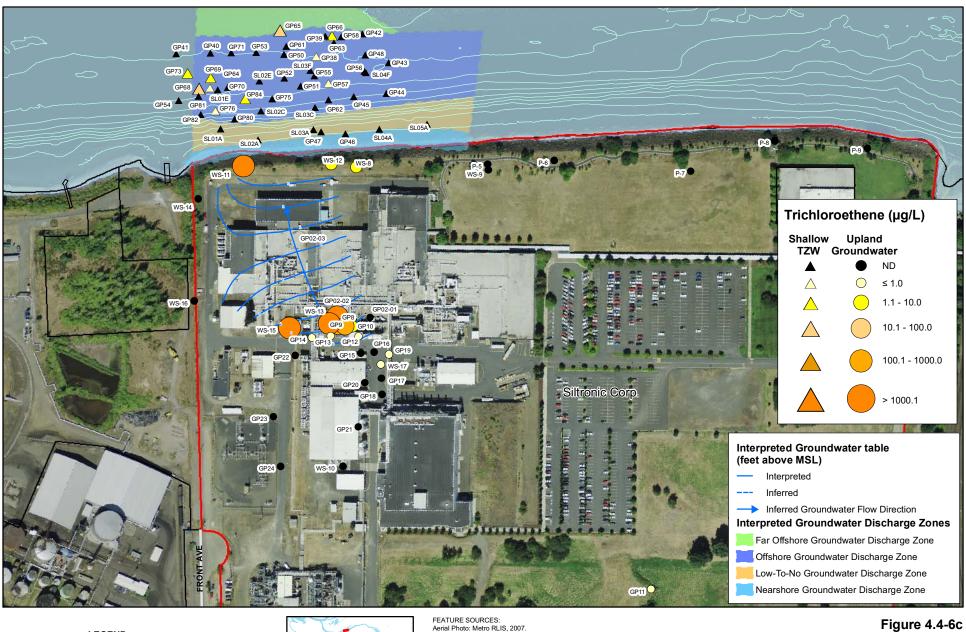
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.

Wells & Groundwater Contours: Locations are approximate and drawn from MFA, 2004. Remedial Investigation Proposal, Siltronic Corporation Site, 7200 NW Front Avenue, Portland, Oregon 97210,

Maul Foster & Alongi, Inc. April 2.

Figure 4.4-6b

Portland Harbor RI/FS Remedial Investigation Report Siltronic Site Total BTEX in Upland Groundwater and Shallow TZW



LEGEND

2003 Bathymetric 5 Ft. Contours (NAVD 88)

Site Property Boundary

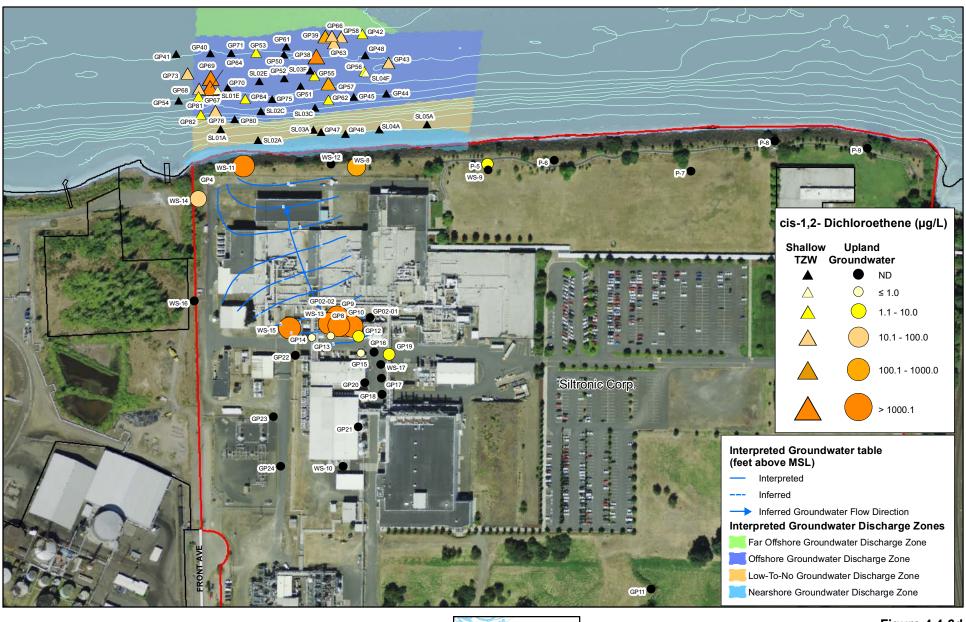


REATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.

Wells & Groundwater Contours: Locations are approximate and drawn from MFA, 2004. Remedial Investigation Proposal, Siltronic Corporation Site, 7200 NW Front Avenue, Portland, Oregon 97210, Maul Foster & Alongi, Inc. April 2.

Portland Harbor RI/FS Remedial Investigation Report Siltronic Site

Trichloroethene in Upland Groundwater and Shallow TZW

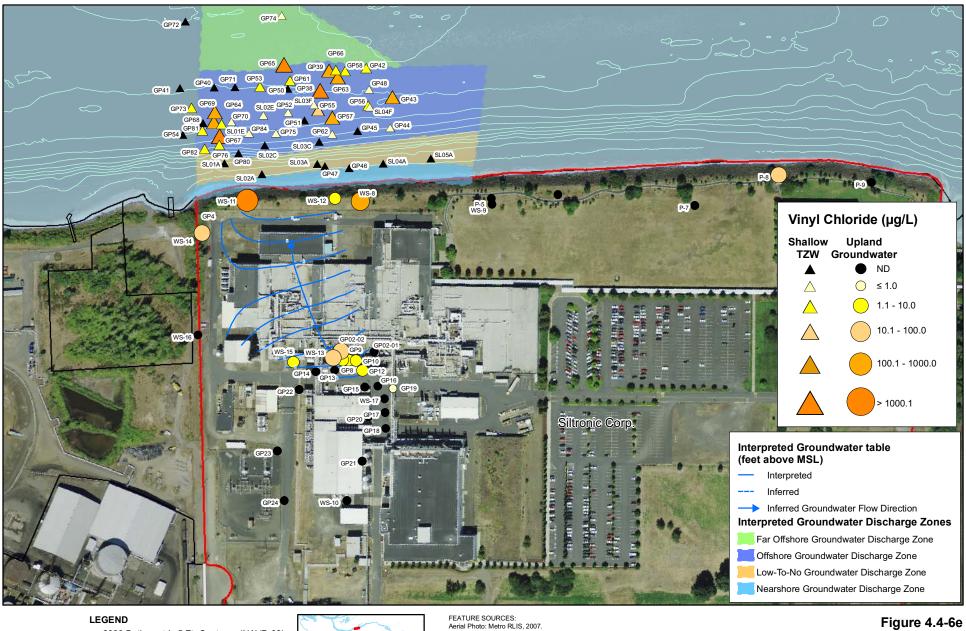


LEGEND 2003 Bathymetric 5 Ft. Contours (NAVD 88) Site Property Boundary 0 100 200 ↑

Feet

FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.
resolution color orthophotos.
Wells & Groundwater Contours: Locations are approximate and drawn from MFA, 2004.
Remedial Investigation Proposal, Siltronic Corporation Site,
7200 NW Front Avenue, Portland, Oregon 97210,
Maul Foster & Alongi, Inc. April 2.

Figure 4.4-6d
Portland Harbor RI/FS
Remedial Investigation Report
Siltronic Site
cis-1,2-Dichloroethene in Upland Groundwater
and Shallow TZW



Site Property Boundary

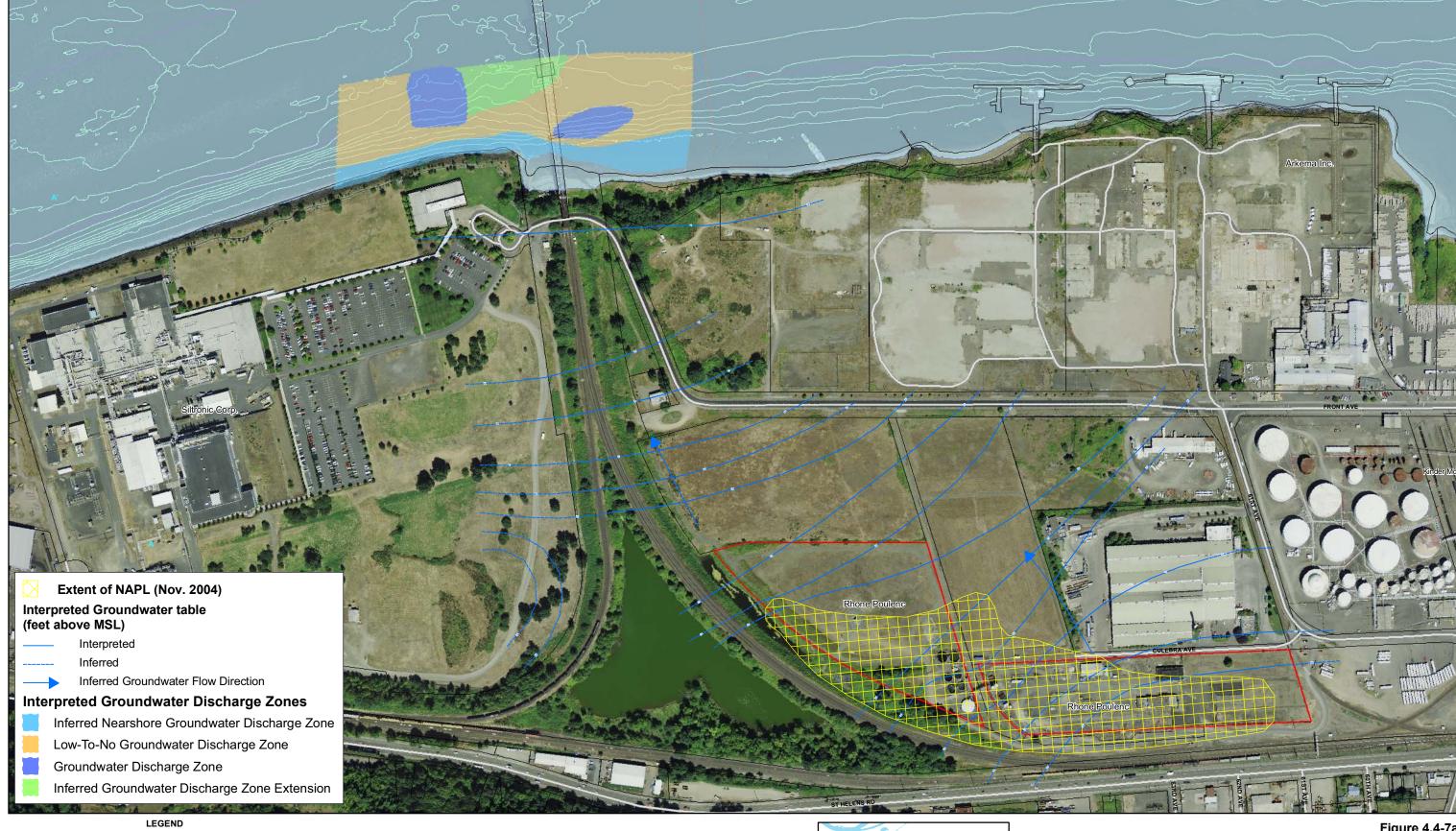


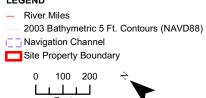
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Wells & Groundwater Contours: Locations are approximate and drawn from MFA, 2004. Remedial Investigation Proposal, Siltronic Corporation Site, 7200 NW Front Avenue, Portland, Oregon 97210,

Maul Foster & Alongi, Inc. April 2.

Portland Harbor RI/FS Remedial Investigation Report Siltronic Site Vinyl Chloride in Upland Groundwater and Shallow TZW

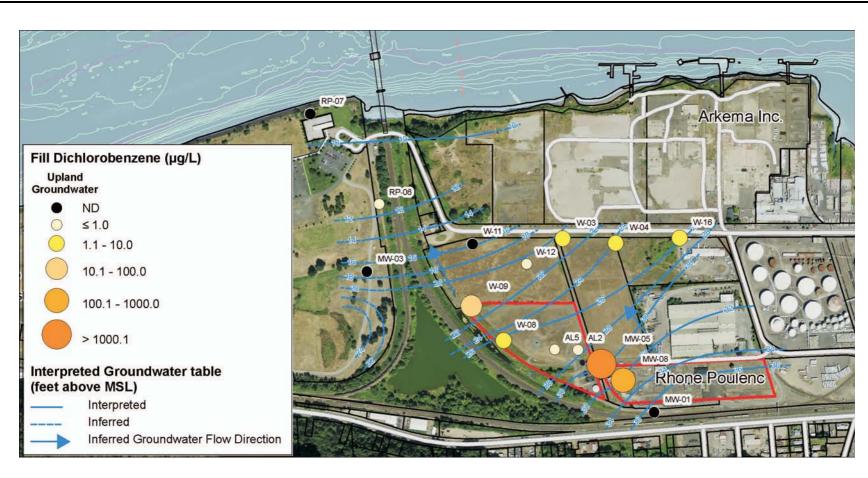


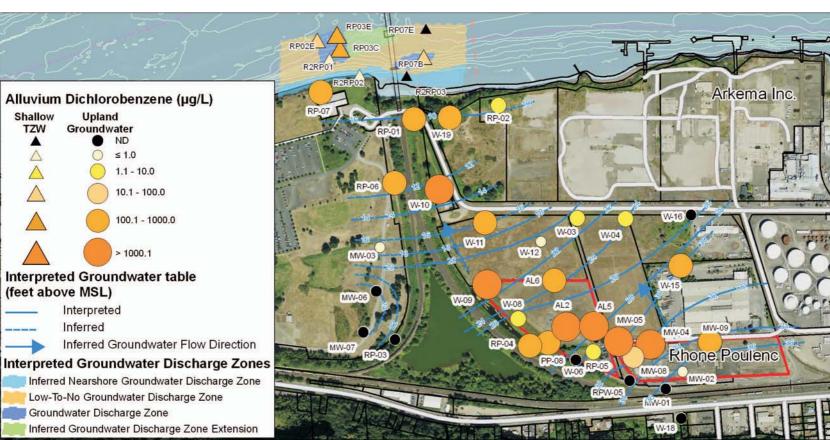


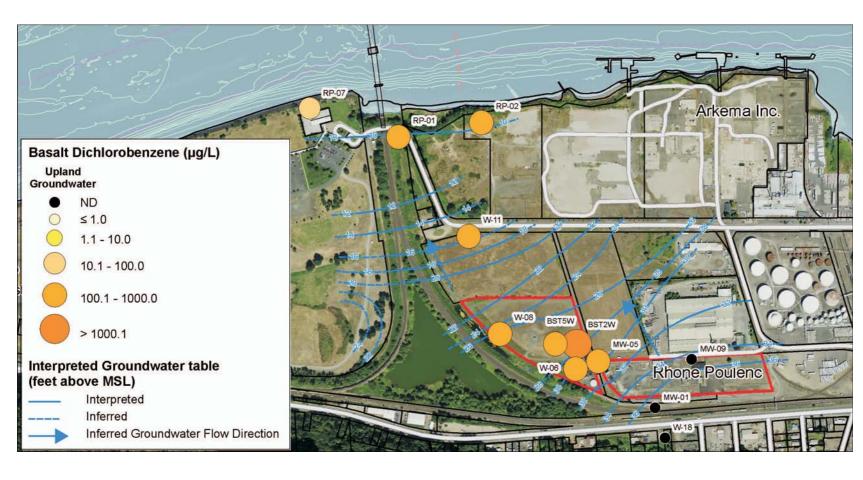
FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft.
resolution color orthophotos.
Wells: Locations are approximate and drawn by measuring from Figure 2 (AMEC, July 2004).
Groundwater Contours: Locations are approximate and drawn by measuring from Figure 3-3
(AMEC, August 2002), Elevations are relative to the City of Portland Datum.



Figure 4.4-7a
Portland Harbor RI/FS
Remedial Investigation Report
Rhone Poulenc Site
Distribution of NAPL in Upland Groundwater









FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up

Chairne and Rivey miles. Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Wells: locations are approximate and drawn by measuring from Figure 2 (AMEC, July 2004) Groundwater Contours: locations are approximate and drawn by measuring from Figure 3-3 (AMEC, August 2002), Elevations are relative to the City of Portland Datum.

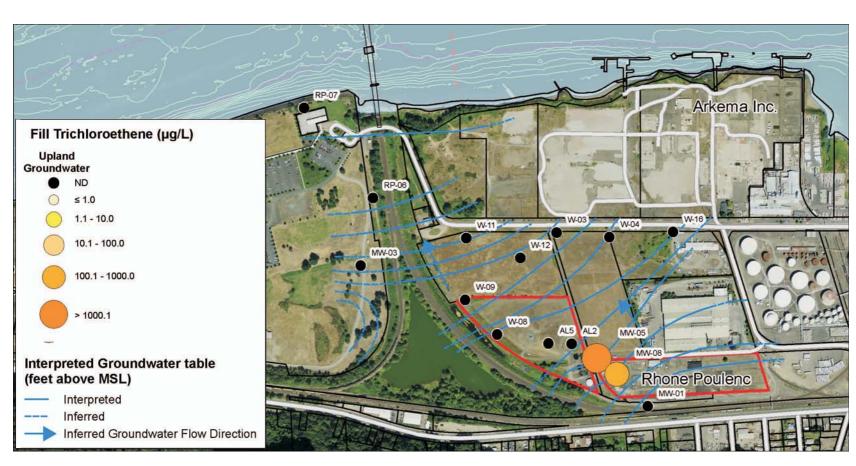
LEGEND

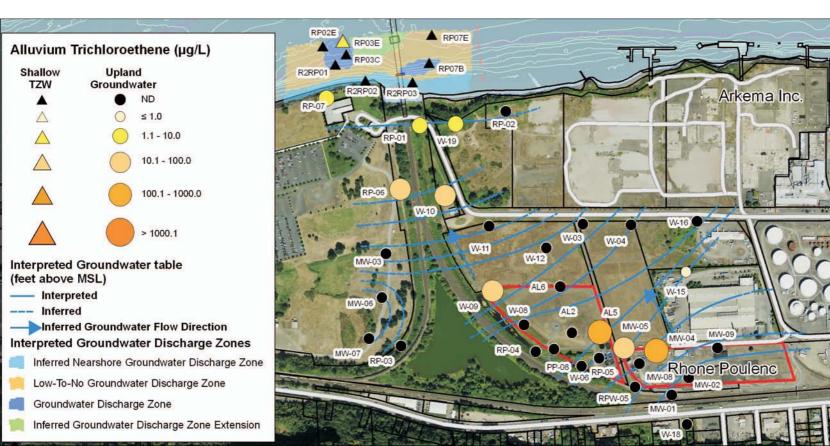
River Miles

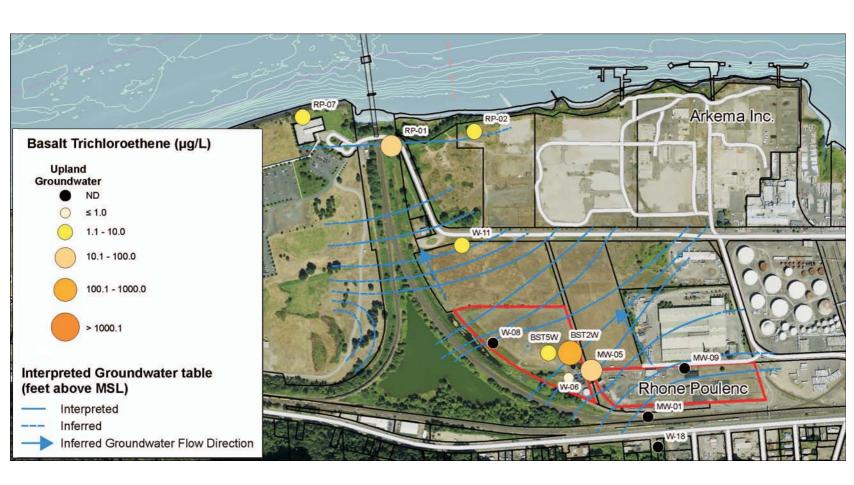
2003 Bathymetric 5 Ft. Contours (NAVD88)

Site Property Boundary

0 150 300 Feet









FEATURE SOURCES: Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information

Chairne and Rivey miles. Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

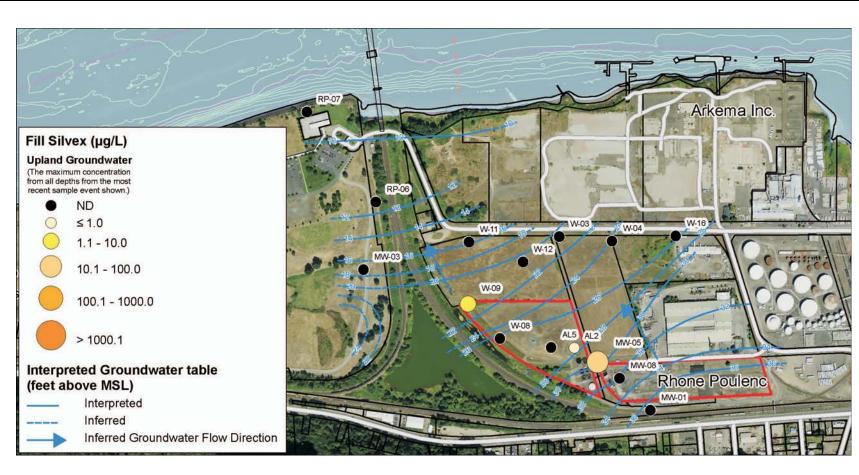
Wells: locations are approximate and drawn by measuring from Figure 2 (AMEC, July 2004) Groundwater Contours: locations are approximate and drawn by measuring from Figure 3-3 (AMEC, August 2002), Elevations are relative to the City of Portland Datum.

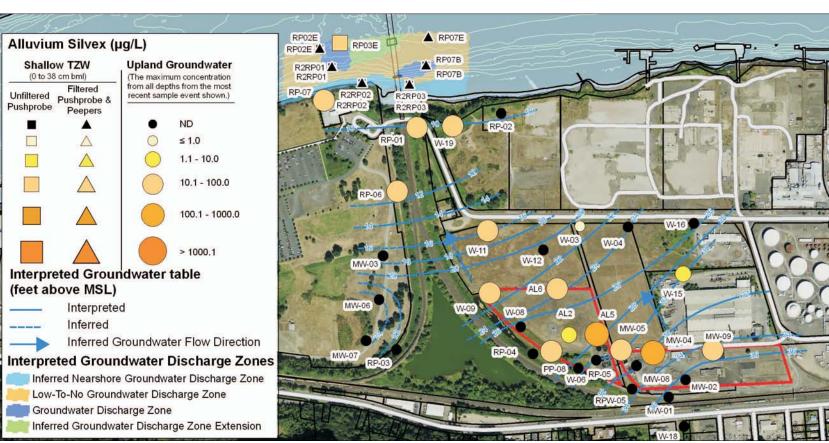
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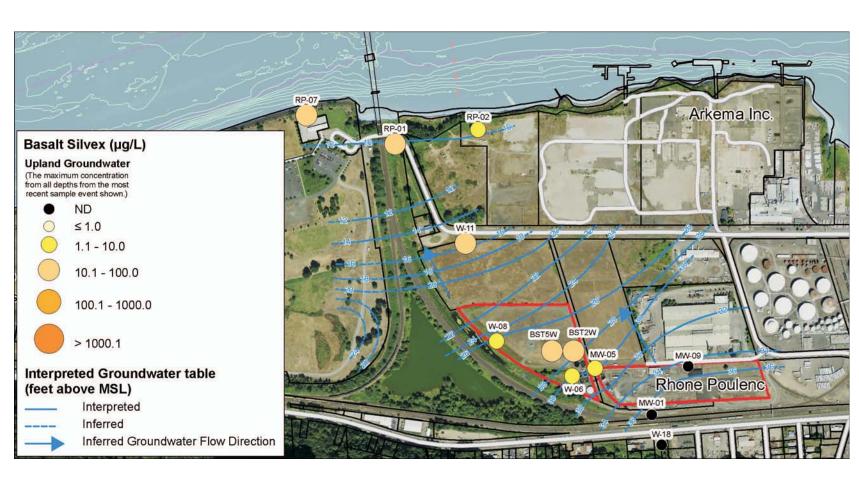
River Miles 2003 Bathymetric 5 Ft. Contours (NAVD88)

Site Property Boundary

0 150 300 Feet لسلسا









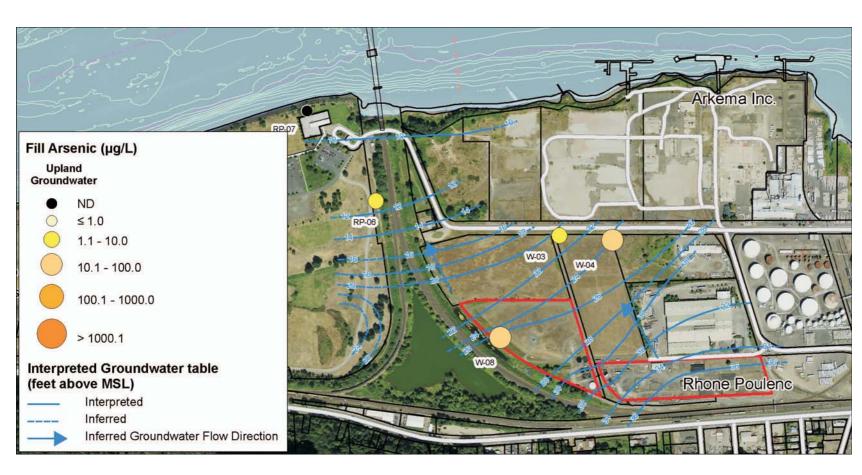


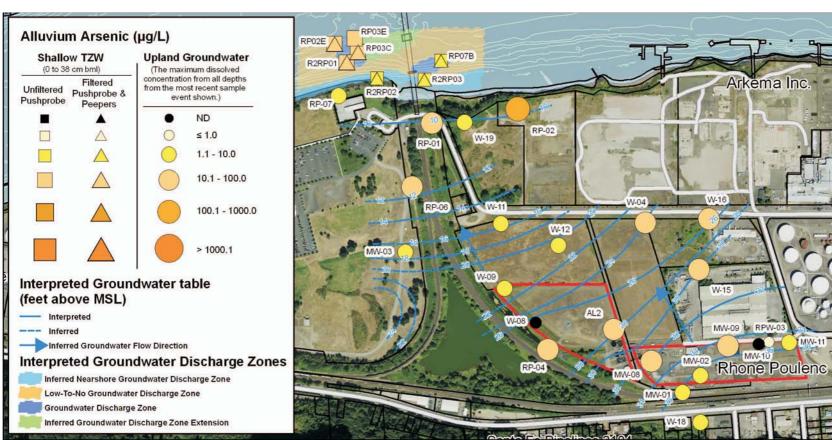
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.

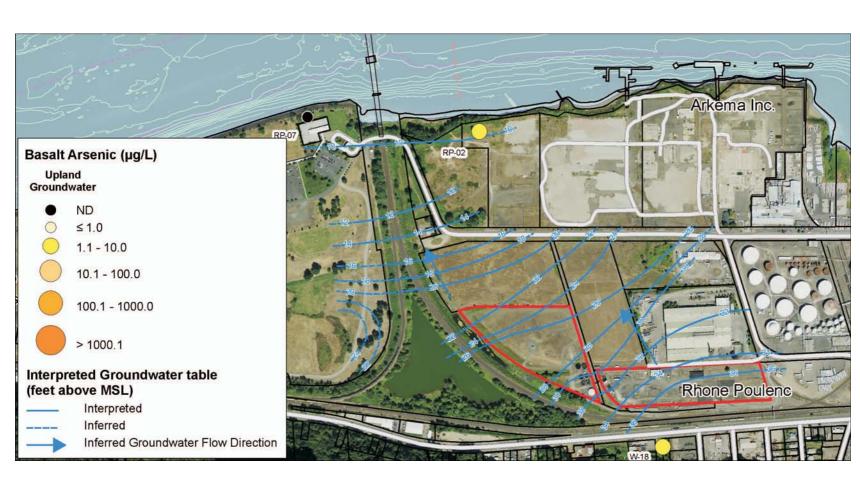
Chainter and River Mines: Developed from Os Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Wells: locations are approximate and drawn by measuring from Figure 2 (AMEC, July 2004)
Groundwater Contours: locations are approximate and drawn by measuring from Figure 3-3
(AMEC, August 2002), Elevations are relative to the City of Portland Datum.









FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up

Chairne and Rivey miles. Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

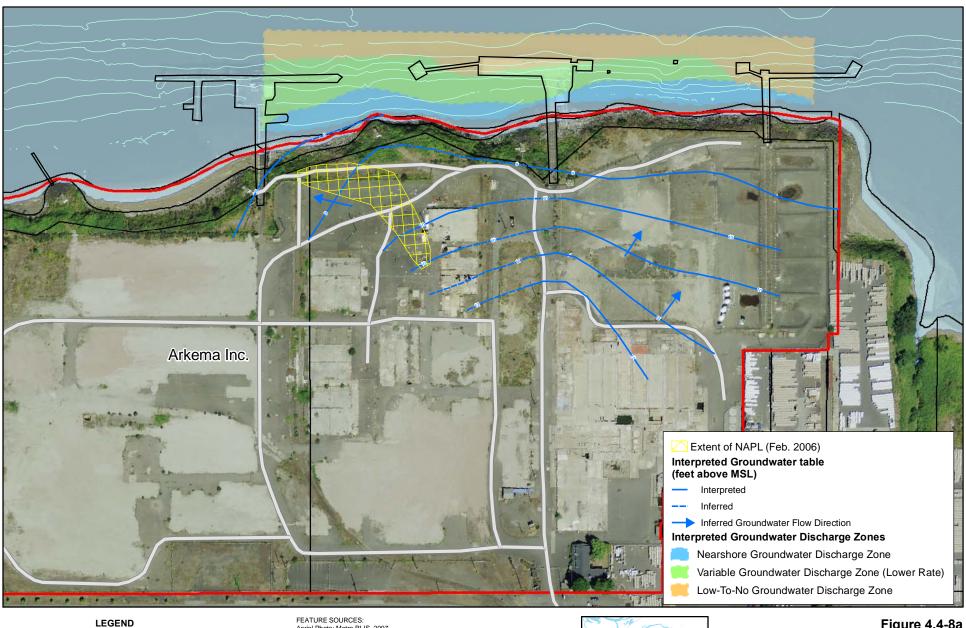
Wells: locations are approximate and drawn by measuring from Figure 2 (AMEC, July 2004) Groundwater Contours: locations are approximate and drawn by measuring from Figure 3-3 (AMEC, August 2002), Elevations are relative to the City of Portland Datum.



- River Miles

2003 Bathymetric 5 Ft. Contours (NAVD88)

Site Property Boundary



Site Property Boundary

Aerial Photo: Metro RLIS, 2007. Aerial Photo: Metro RLIS, 2007.

2003 Bathymetric 5 Ft. Contours (NAVD 88)

Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the Cotober 2001 0.33 ft. resolution color orthophotos.
Groundwater Contours: locations are approximate and drawn from ERM. 2004a.
Upland Remedial Investigation Report, Lots 3 & 4 and Tract A, ATOFINA Chemicals
Facility, Portland, OR. Prepared for ATOFINA Chemicals, Inc., Portland, OR. ERM-West, Inc., Bellvue, WA.

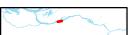
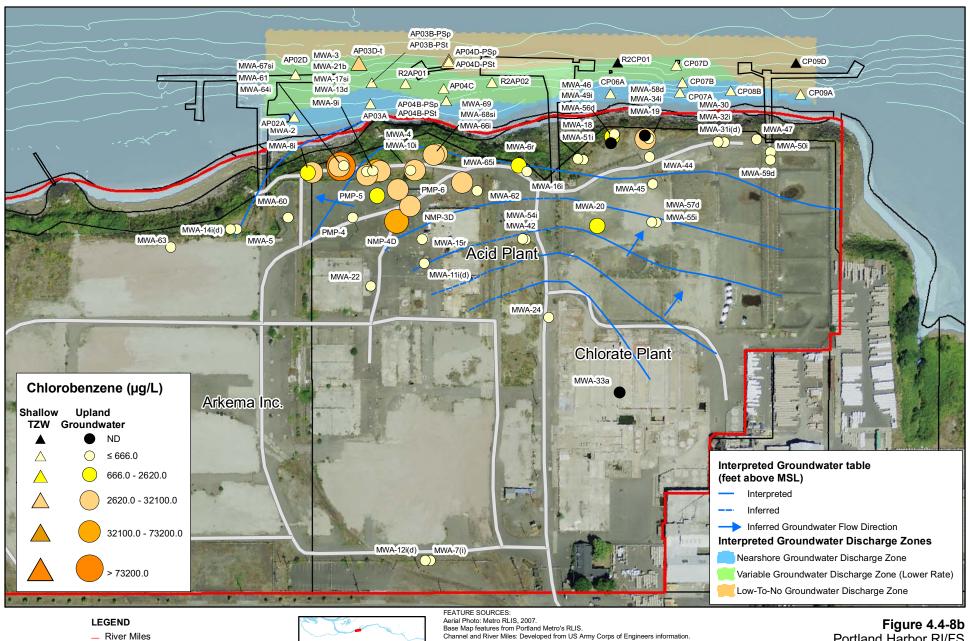


Figure 4.4-8a Portland Harbor RI/FS Remedial Investigation Report Arkema Site Distribution of NAPL in Upland Groundwater



River Miles

2003 Bathymetric 5 Ft. Contours (NAVD 88)

Site Property Boundary

0 50 100

Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information.

Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Groundwater elevation contours and flow directions adapted from ERM 2005.

Upland Remedial Investigation Report Lots 3 & 4 and Tract A - Revision 1,

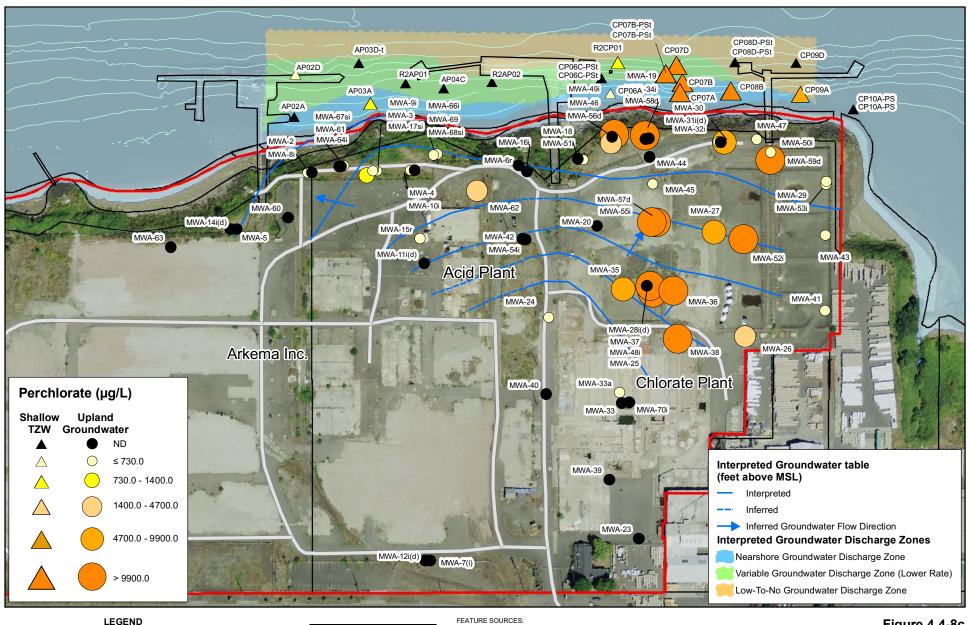
Arkema, Inc. Portland Facility. December 2005

Groundwater Wells: locations are approximate and are drawn from ERM 2004a.

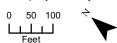
Upland Remedial Investigation Report, Lots 3 & 4 and Tract A,

ATOFINA Chemicals Facility, Portland, OR. and the Sitewide Groundwater Monitoring Report
April 2007 Monitoring Event, Arkema, Inc. Facility, Portland, Oregon, ERM, October 2007

Figure 4.4-8b
Portland Harbor RI/FS
Remedial Investigation Report
Arkema Site
Chlorobenzene in Upland Groundwater
and Shallow TZW



2003 Bathymetric 5 Ft. Contours (NAVD 88) Site Property Boundary



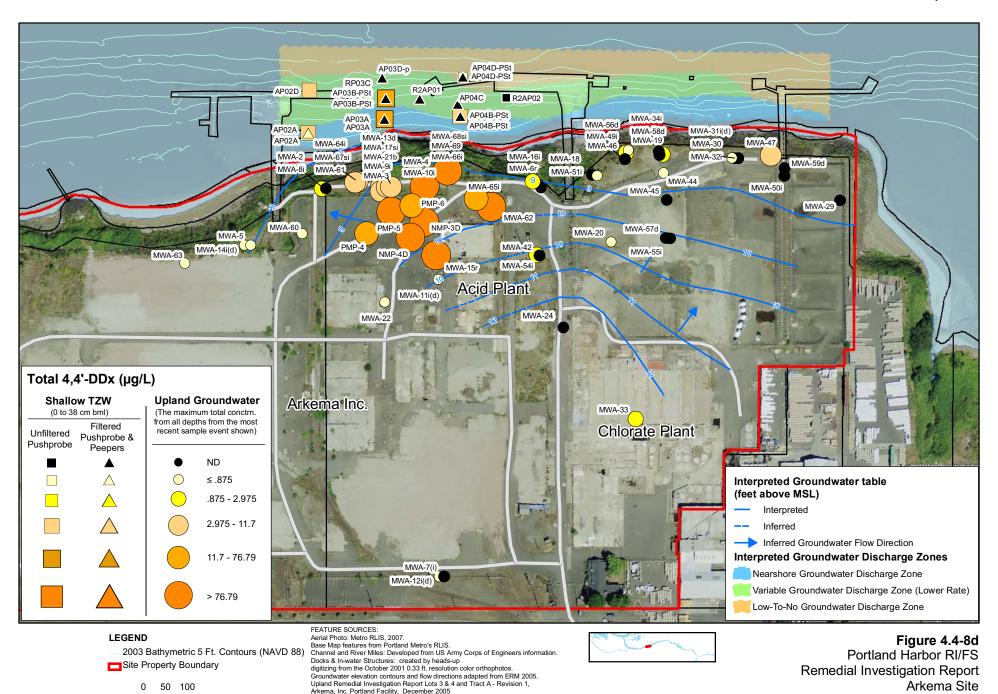
Aerial Photo: Metro RLIS, 2007. Base Map features from Portland Metro's RLIS.

Channel and River Miles: Developed from US Army Corps of Engineers information. Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater elevation contours and flow directions adapted from ERM 2005. Upland Remedial Investigation Report Lots 3 & 4 and Tract A - Revision 1, Arkema, Inc. Portland Facility. December 2005 Groundwater Wells: locations are approximate and are drawn from ERM 2004a Upland Remedial Investigation Report, Lots 3 & 4 and Tract A, ATOFINA Chemicals Facility, Portland, OR. and the Sitewide Groundwater Monitoring Report – April 2007 Monitoring Event, Arkema, Inc. Facility, Portland, Oregon, ERM, October 2007

Figure 4.4-8c Portland Harbor RI/FS Remedial Investigation Report Arkema Site Perchlorate in Upland Groundwater and Shallow TZW

Total of 4,4'-DDx in Upland Groundwater

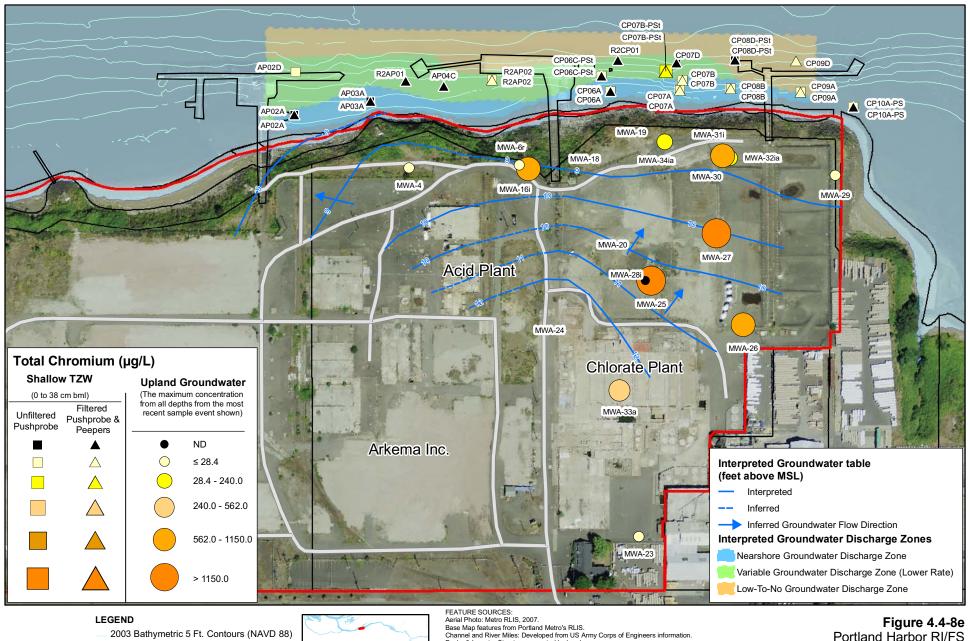
and Shallow TZW



Groundwater Wells: locations are approximate and are drawn from ERM 2004a

Feet

Upland Remedial Investigation Report, Lots 3 & 4 and Tract A, ATOFINA Chemicals Facility, Portland, OR, and the Sitewide Groundwater Monitoring Report – April 2007 Monitoring Event, Arkema, Inc. Facility, Portland, Oregon, ERM, October 2007



Site Property Boundary



Docks & In-water Structures: created by heads-up

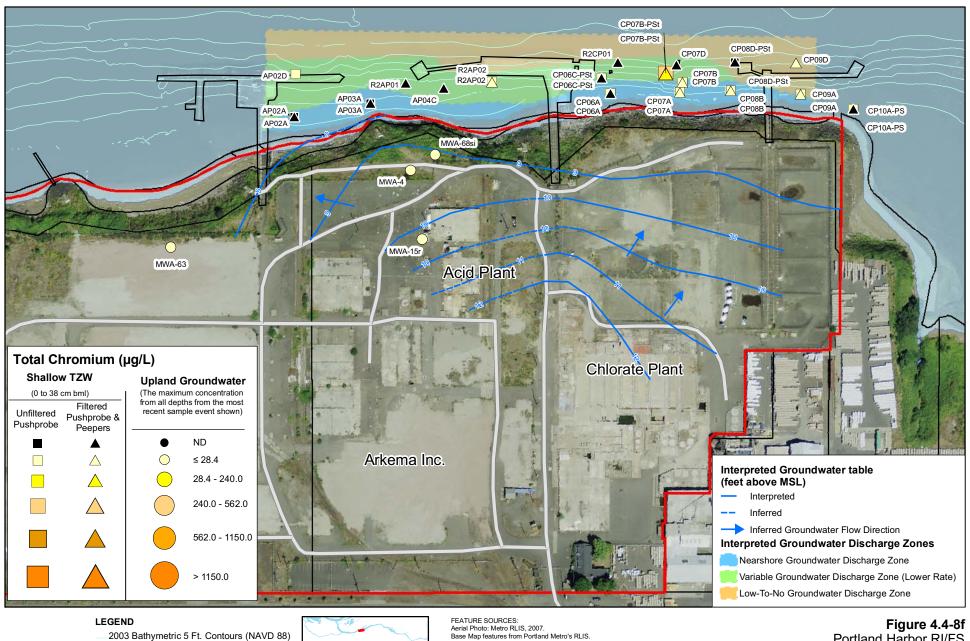
digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater elevation contours and flow directions adapted from ERM 2005. Upland Remedial Investigation Report Lots 3 & 4 and Tract A - Revision 1, Arkema, Inc. Portland Facility. December 2005

Groundwater Wells: locations are approximate and are drawn from ERM 2004a. Upland Remedial Investigation Report, Lots 3 & 4 and Tract A,

ATOFINA Chemicals Facility, Portland, OR. and the Sitewide Groundwater Monitoring Report -April 2007 Monitoring Event, Arkema, Inc. Facility, Portland, Oregon, ERM, October 2007

Portland Harbor RI/FS Remedial Investigation Report Arkema Site **Total Chromium in Upland Groundwater**

and Shallow TZW (2003 Data)



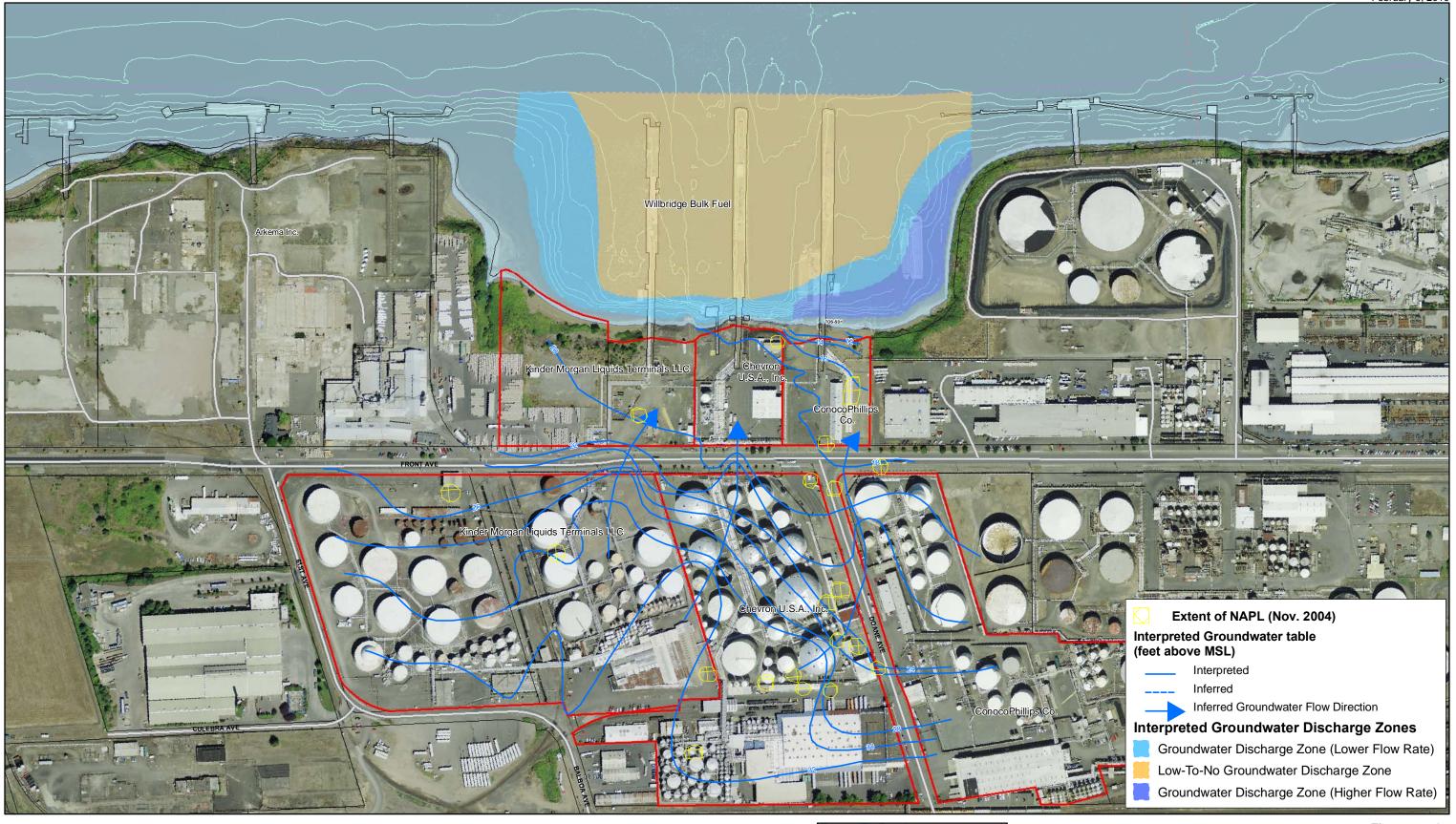
Site Property Boundary



Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater elevation contours and flow directions adapted from ERM 2005. Upland Remedial Investigation Report Lots 3 & 4 and Tract A - Revision 1, Arkema, Inc. Portland Facility. December 2005

Groundwater Wells: locations are approximate and are drawn from ERM 2004a. Upland Remedial Investigation Report, Lots 3 & 4 and Tract A, ATOFINA Chemicals Facility, Portland, OR. and the Sitewide Groundwater Monitoring Report – April 2007 Monitoring Event, Arkema, Inc. Facility, Portland, Oregon, ERM, October 2007

Portland Harbor RI/FS Remedial Investigation Report Arkema Site Total Chromium in Upland Groundwater and Shallow TZW (2006-2007 Data)



River Miles

2003 Bathymetric 5 Ft. Contours (NAVD88)

Navigation Channel

Site Property Boundary

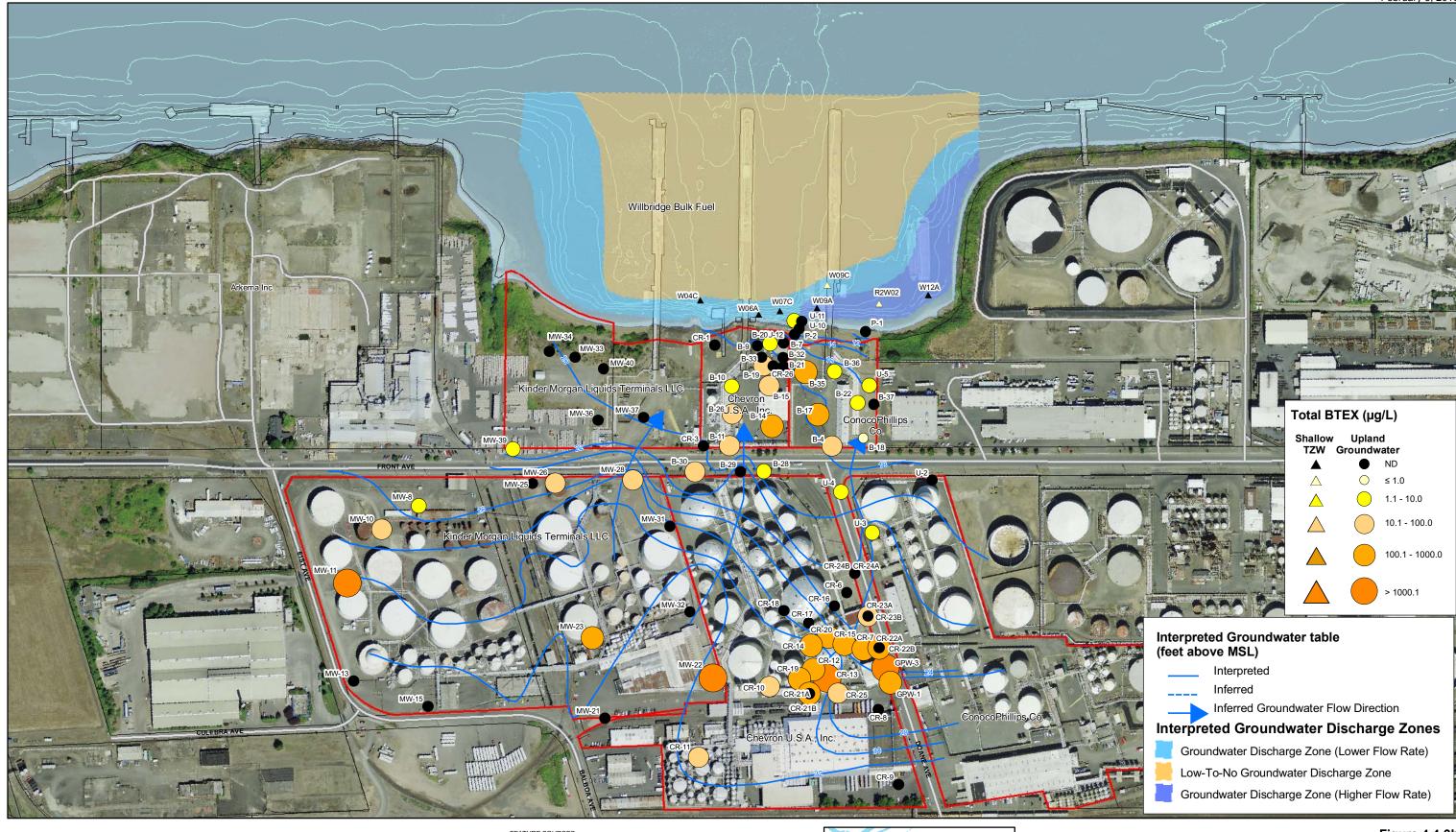




FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.



Figure 4.4-9a Portland Harbor RI/FS Remedial Investigation Report Willbridge Site Distribution of NAPL in Upland Groundwater



2003 Bathymetric 5 Ft. Contours (NAVD88)

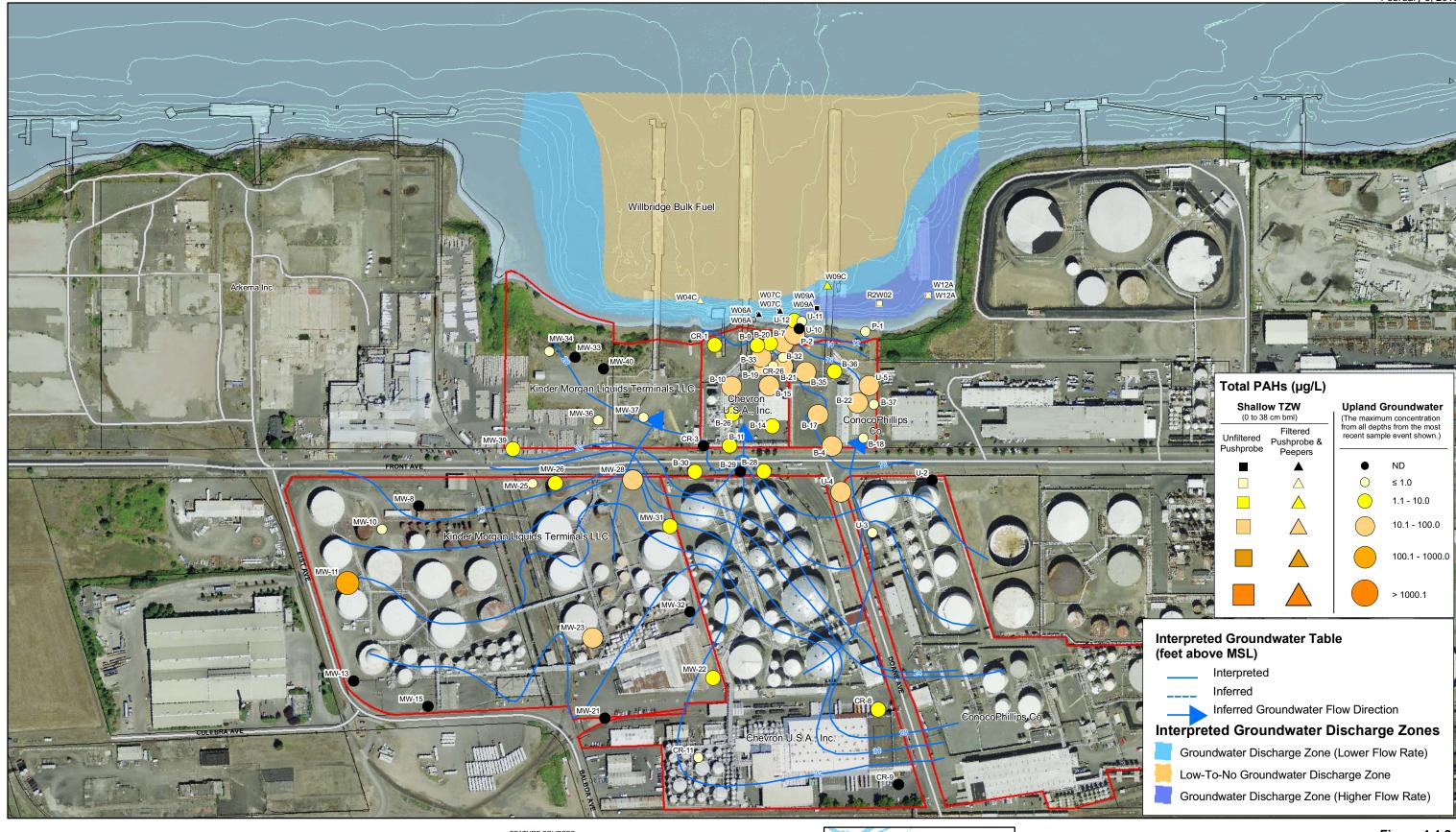
Site Property Boundary



FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.35 ft. resolution color orthophotos.
Wells: locations are approximate and drawn from Delta
Environmental Consultants 2005. Semi Annual Groundwater
Monitoring Report (April 2004 through September 2004,
Willbridge Bulk Fuel Terminals, March 15, 2005.



Figure 4.4-9b Portland Harbor RI/FS Remedial Investigation Report Willbridge Site Total BTEX in Upland Groundwater and Shallow TZW



2003 Bathymetric 5 Ft. Contours (NAVD88)

Site Property Boundary

0 100 200 Feet

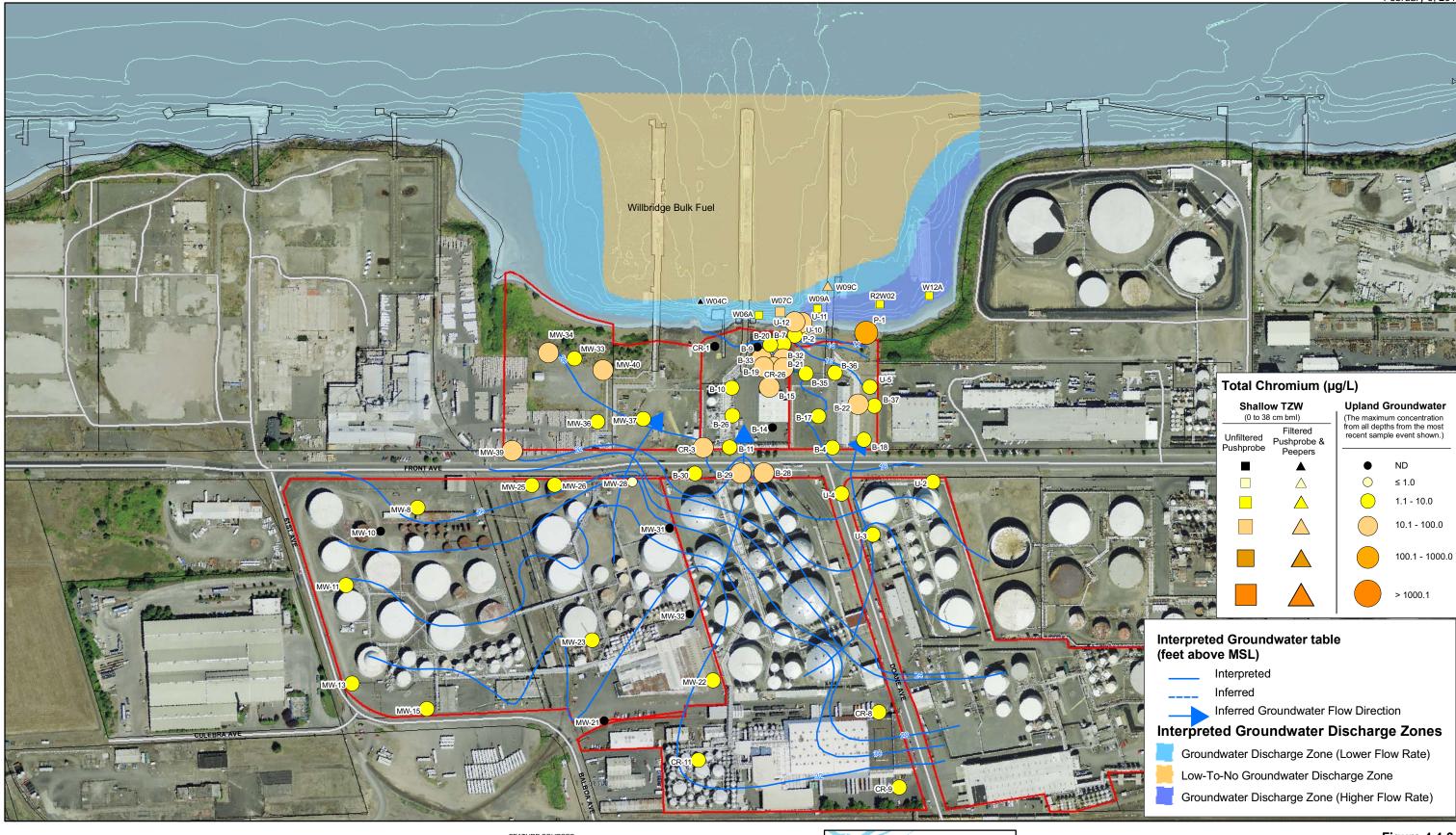
0 200 _____ ÷ et FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.
Wells: locations are approximate and drawn from Delta
Environmental Consultants 2005. Semi Annual Groundwater
Monitoring Report (April 2004 through September 2004,
Willbridge Bulk Fuel Terminals, March 15, 2005.



Figure 4.4-9c Portland Harbor RI/FS

Remedial Investigation Report Willbridge Site Total PAHs in Upland Groundwater

and Shallow TZW



2003 Bathymetric 5 Ft. Contours (NAVD88)

Site Property Boundary

0 100 200

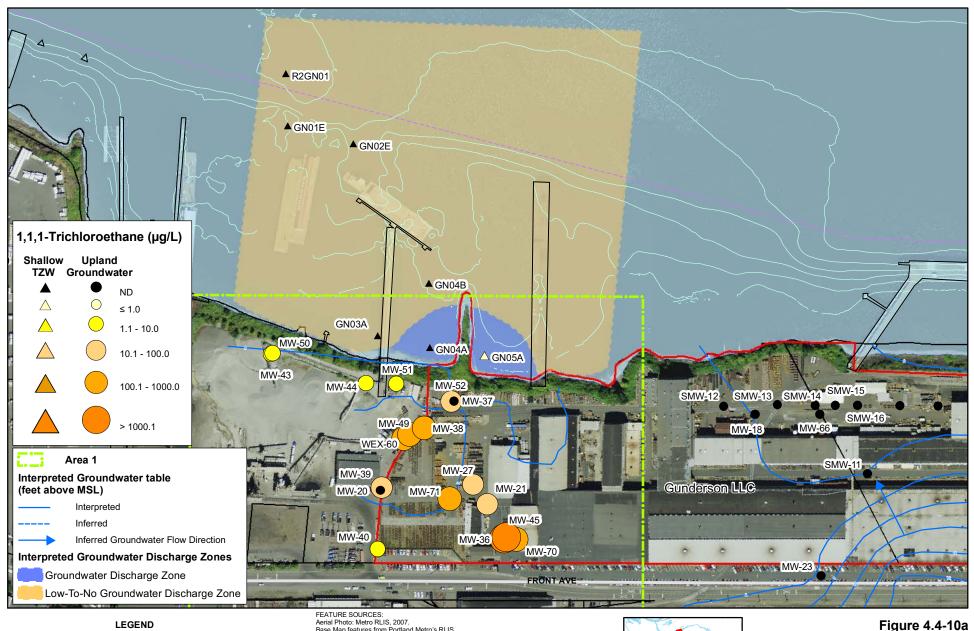
Feet

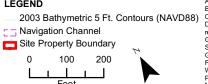
FEATURE SOURCES:
Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up
digitizing from the October 2001 0.33 ft. resolution color orthophotos.
Wells: locations are approximate and drawn from Delta
Environmental Consultants 2005. Semi Annual Groundwater
Monitoring Report (April 2004 through September 2004,
Willbridge Bulk Fuel Terminals, March 15, 2005.



Figure 4.4-9d

Portland Harbor RI/FS
Remedial Investigation Report
Willbridge Site
Total Chromium in Upland Groundwater
and Shallow TZW





Base Map features from Portland Metro's RLIS. 2003 Bathymetric 5 Ft. Contours (NAVD88) Channel and River Miles: Developed from US Army Corps of Engineers information.

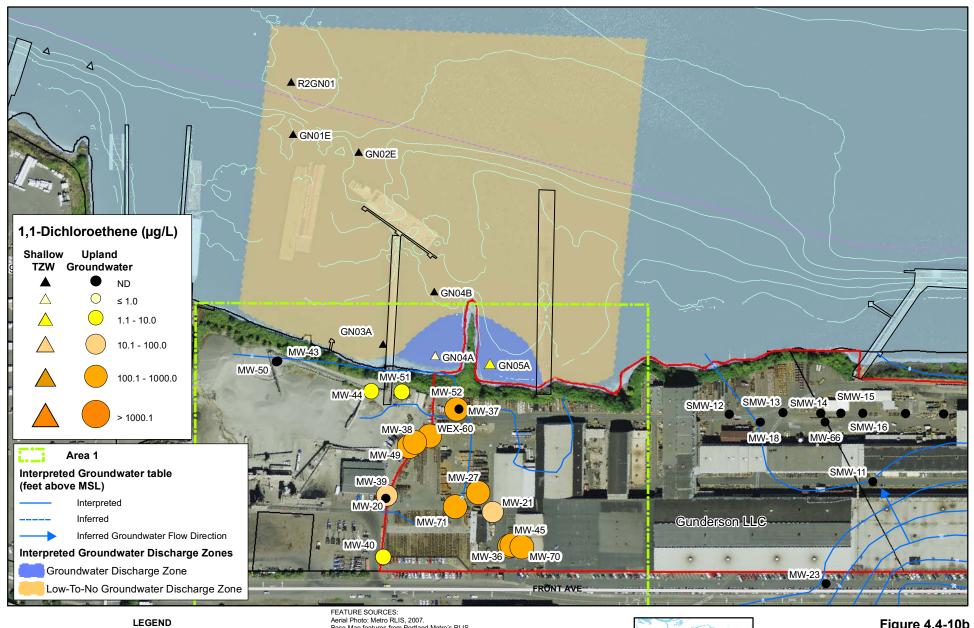
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Groundwater Contours: locations are approximate and drawn from Squier/Kleinfelder, LLC. 2005. Gunderson, Inc.

Groundwater Monitoring: Thirty-Fifth Quarterly Groundwater Sampling Event, ECSI #1155. Final ed.; Prepared for Gunderson, Inc. S090445.21. Rec#SQA0020.

Wells & Remediation Systems: locations are approximate and drawn from King, D. 2005c -Personal communication (telephone conversations with S. FitzGerald, Integral Consulting, Mercer Island, WA, on April 1 and 4, 2005 regarding the Gunderson Facility). Squier/Kleinfelder, Lake Oswego, OR.

Portland Harbor RI/FS Remedial Investigation Report **Gunderson Site** 1,1,1-Trichloroethane in Upland Groundwater and Shallow TZW



Navigation Channel Site Property Boundary 100 200

Feet

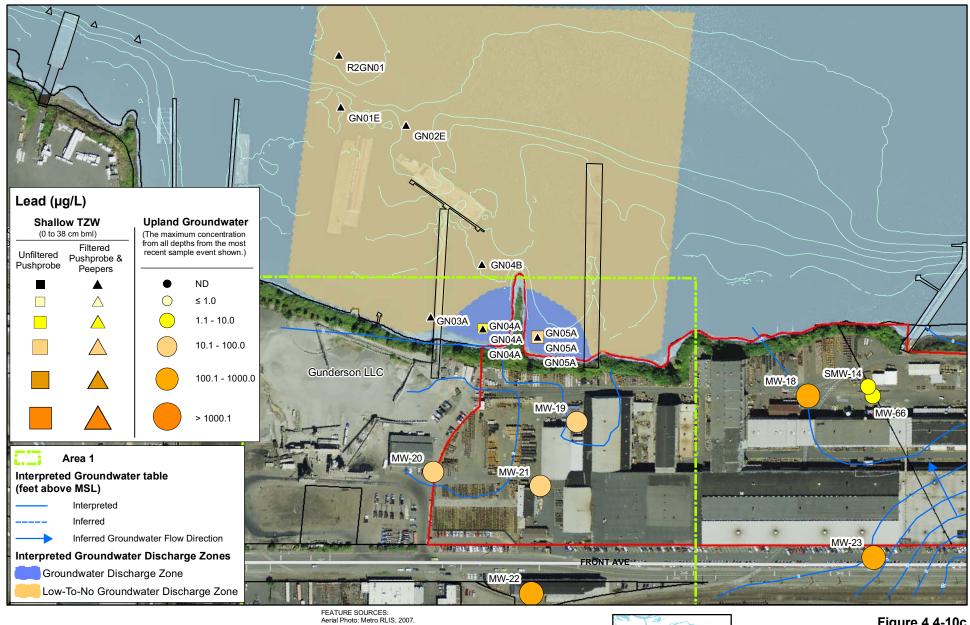
ABrian Fridou, insert O.L.O., 2007.
Base Map features from Portland Metro's RLIS.
Channel and River Miles: Developed from US Army Corps of Engineers information.
Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos. Groundwater Contours: locations are approximate and drawn from

Squier/Kleinfelder, LLC. 2005. Gunderson, Inc.
Groundwater Monitoring: Thirty-Fifth Quarterly
Final ed.; Prepared for Gunderson, Inc. S090445.21. Rec#SQA0020.

Wells & Remediation Systems: locations are approximate and drawn from King, D. 2005c – Personal communication (telephone conversations with S. FitzGerald, Integral Consulting, Mercer Island, WA, on April 1 and 4, 2005 regarding the Gunderson Facility). Squier/Kleinfelder, Lake Oswego, OR,



Figure 4.4-10b Portland Harbor RI/FS Remedial Investigation Report **Gunderson Site** 1,1-Dichloroethene in Upland Groundwater and Shallow TZW



2003 Bathymetric 5 Ft. Contours (NAVD88) Site Property Boundary

> 100 200 Feet



Aerial Photo: Metro RLIS, 2007.
Base Map features from Portland Metro's RLIS. Channel and River Miles: Developed from US Army Corps of Engineers information. Docks & In-water Structures: created by heads-up digitizing from the October 2001 0.33 ft. resolution color orthophotos.

Groundwater Contours: locations are approximate and drawn from Squier/Kleinfelder, LLC. 2005. Gunderson, Inc. Groundwater Monitoring: Thirty-Fifth Quarterly Groundwater Sampling Event, ECSI #1155. Final ed.; Prepared for Gunderson, Inc. S090445.21. Rec#SQA0020.

Wells & Remediation Systems: locations are approximate and drawn from King, D. 2005c -Personal communication (telephone conversations with S. FitzGerald, Integral Consulting, Mercer Island, WA, on April 1 and 4, 2005 regarding the Gunderson Facility). Squier/Kleinfelder, Lake Oswego, OR.



Figure 4.4-10c Portland Harbor RI/FS Remedial Investigation Report Gunderson Site Total Lead in Upland Groundwater and Shallow TZW

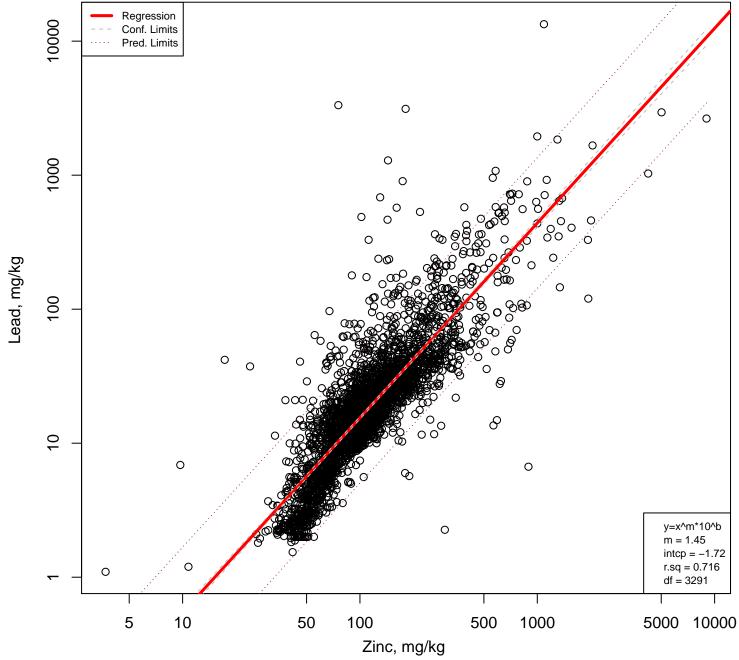


Figure 5.1-1
Portland Harbor RI/FS
Remedial Investigation Report
Correlation Plot of Lead and
Zinc in Surface Sediment

Figure 5.1-2 Portland Harbor RI/FS Remedial Investigation Report Correlation Plot of Carcinogenic PAHs and Total PAHs in Surface Sediment

February 8, 2016

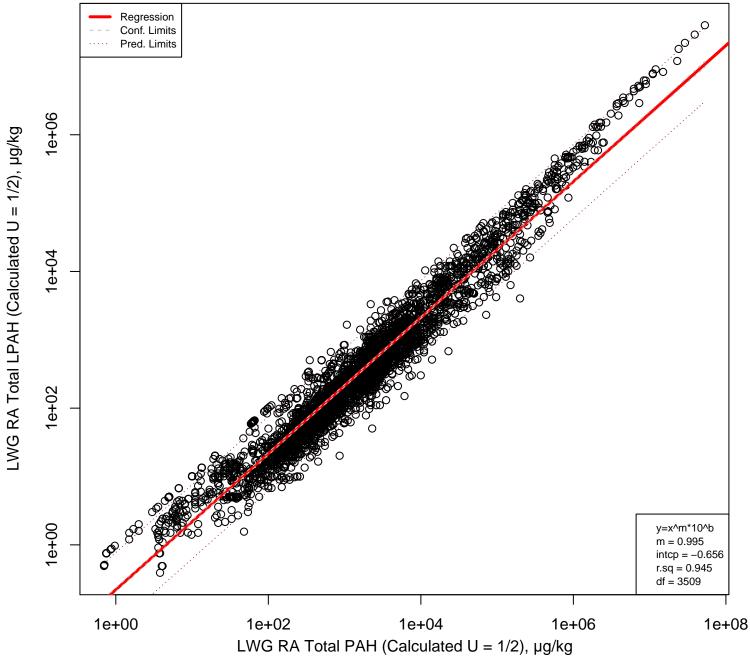


Figure 5.1-3
Portland Harbor RI/FS
Remedial Investigation Report
Correlation Plot of Low Molecular Weight PAHs and
Total PAHs in Surface Sediment

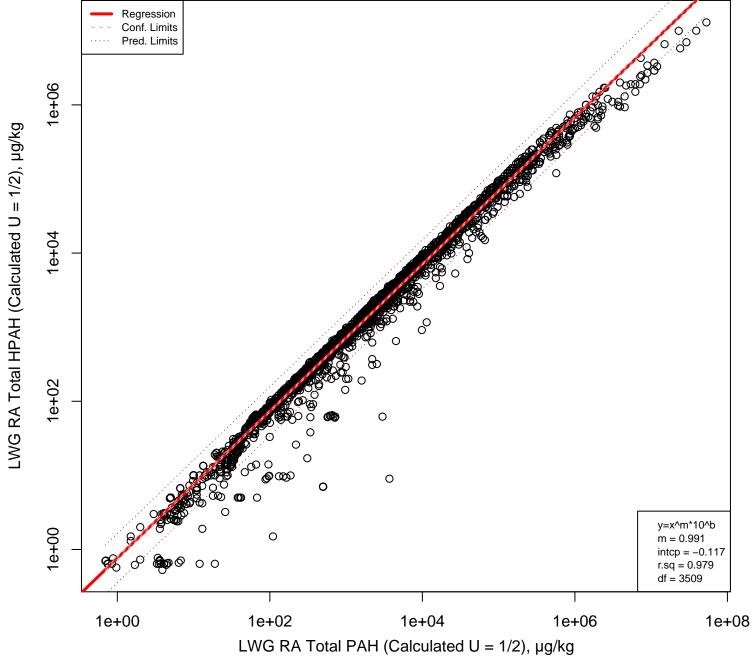


Figure 5.1-4
Portland Harbor RI/FS
Remedial Investigation Report
Correlation Plot of High Molecular Weight PAHs and
Total PAHs in Surface Sediment

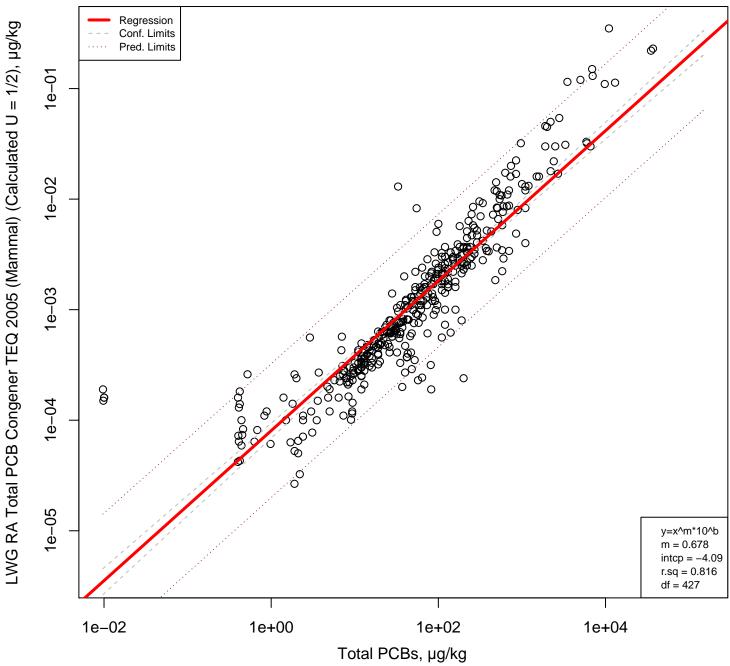


Figure 5.1-5
Portland Harbor RI/FS
Remedial Investigation Report
Correlation Plot of PCB TEQ and
Total PCBs in Surface Sediment

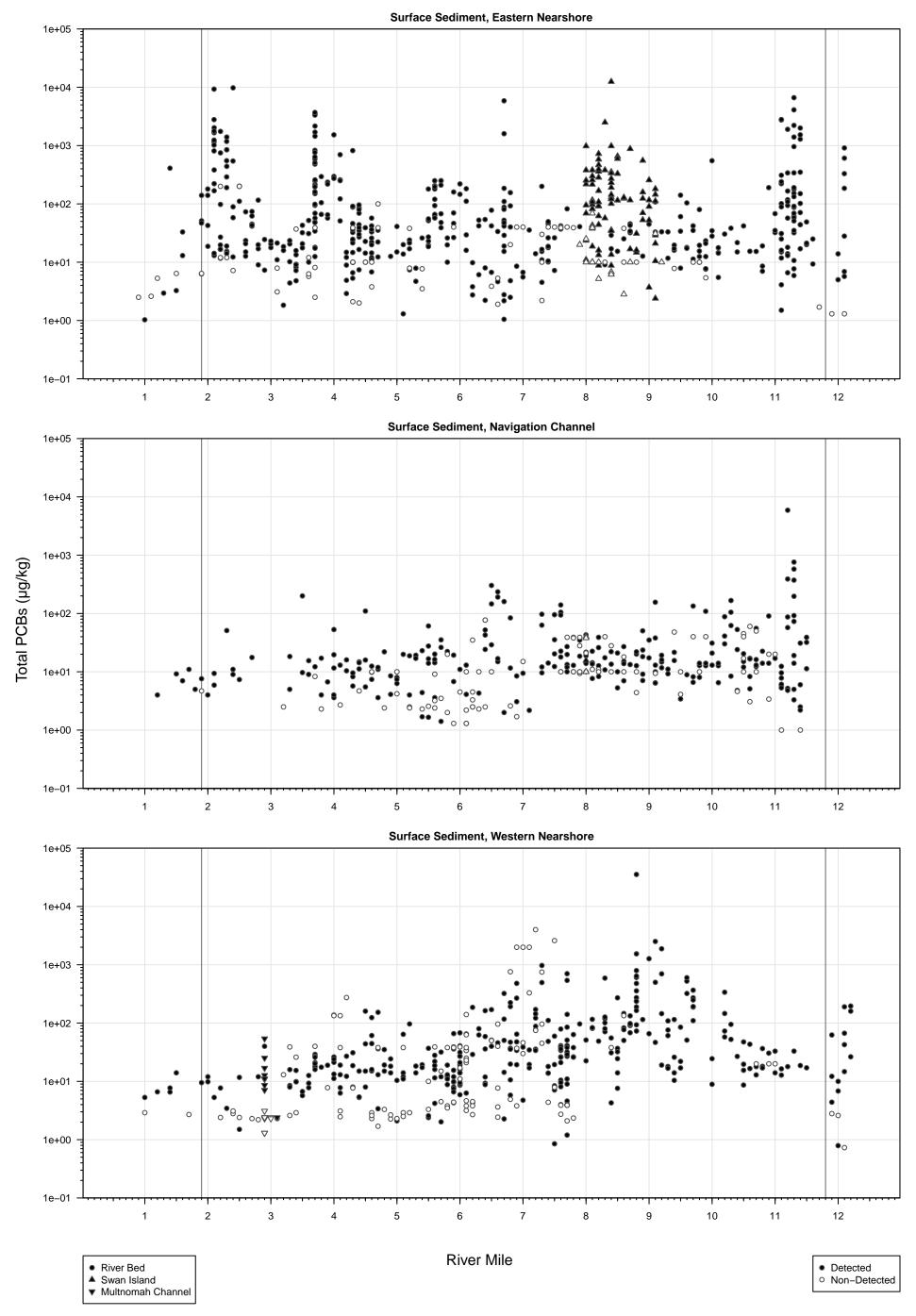


Figure 5.2–1
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCBs
Concentrations in Surface Sediment, RM 0.8–12.2

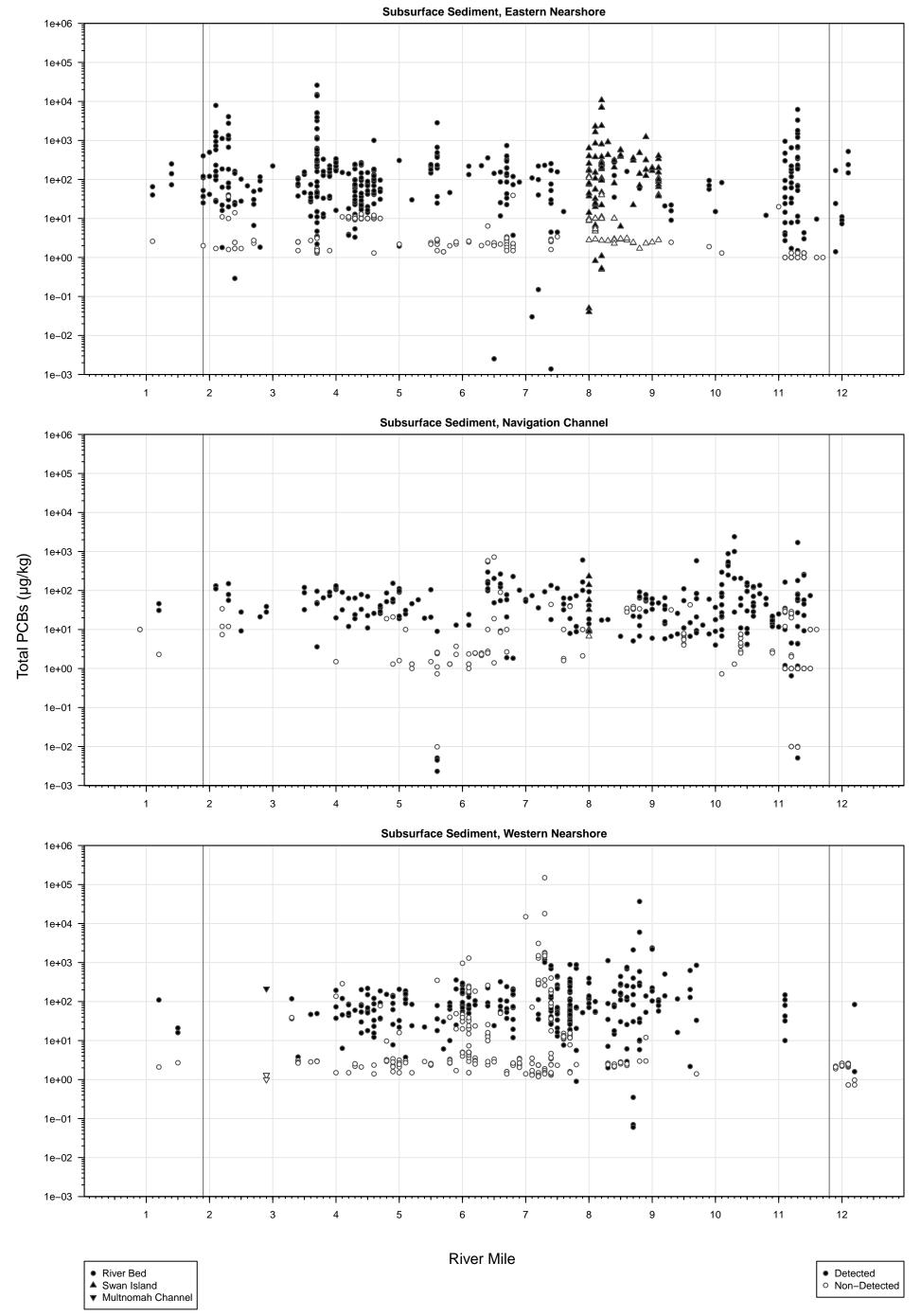


Figure 5.2-2
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCBs
Concentrations in Subsurface Sediment, RM 0.8-12.2

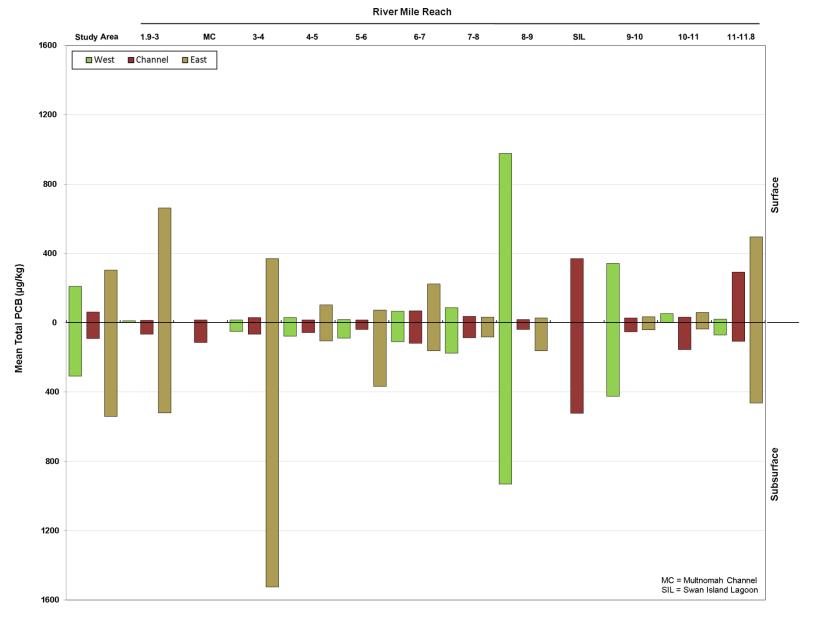


Figure 5.2-3
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Total PCBs Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

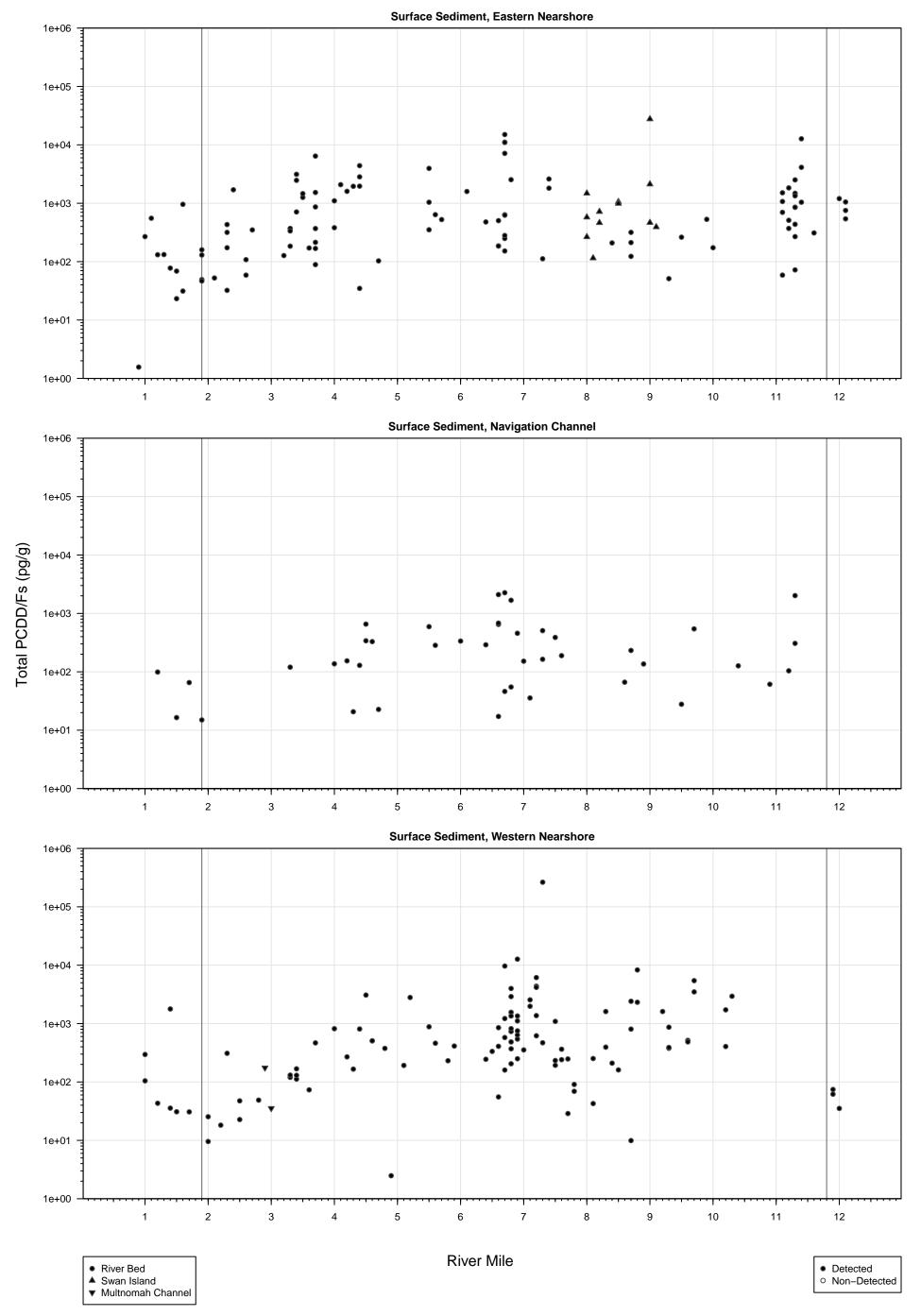


Figure 5.2–4
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCDD/Fs
Concentrations in Surface Sediment, RM 0.8–12.2

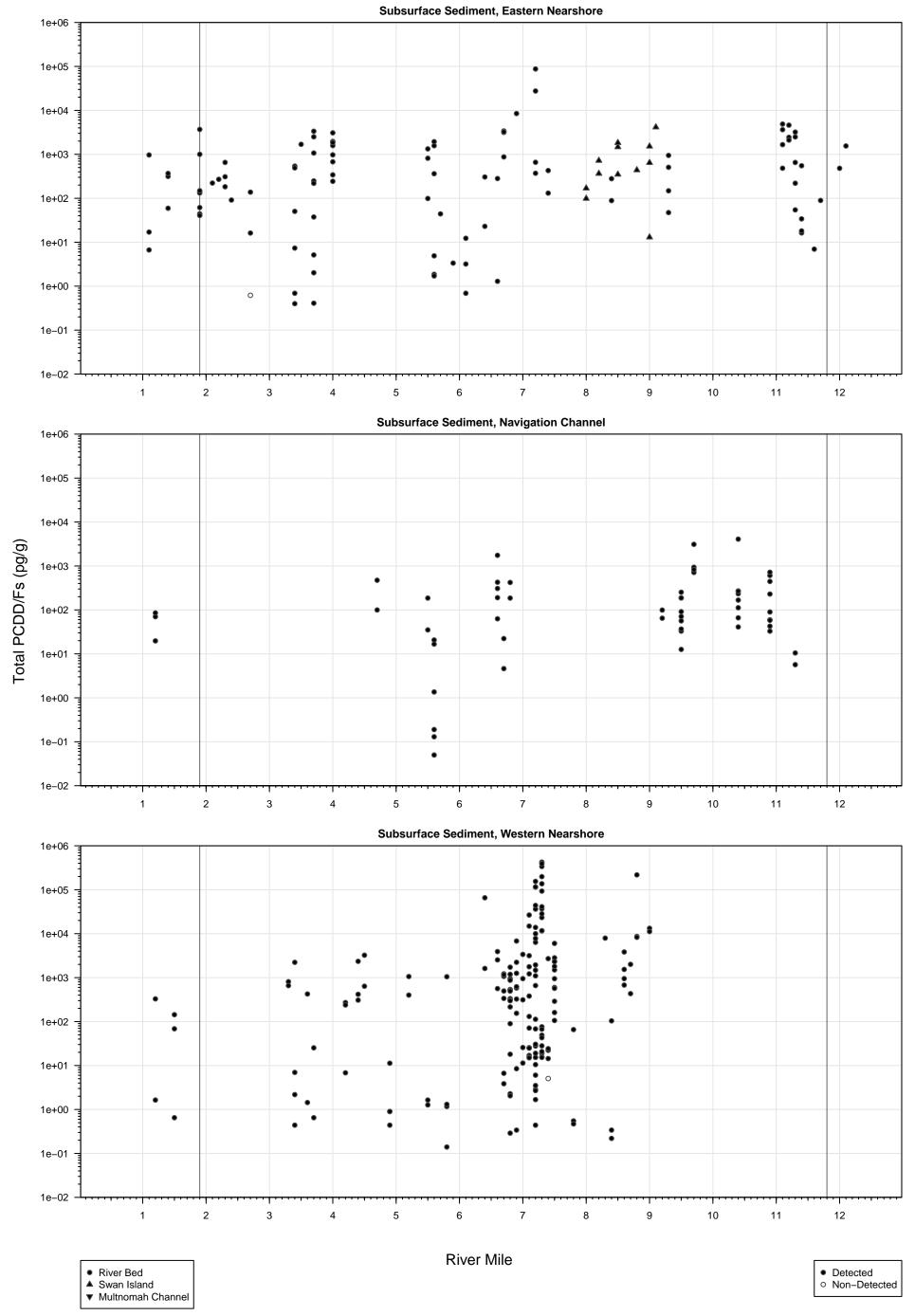


Figure 5.2-5
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCDD/Fs
Concentrations in Subsurface Sediment, RM 0.8–12.2

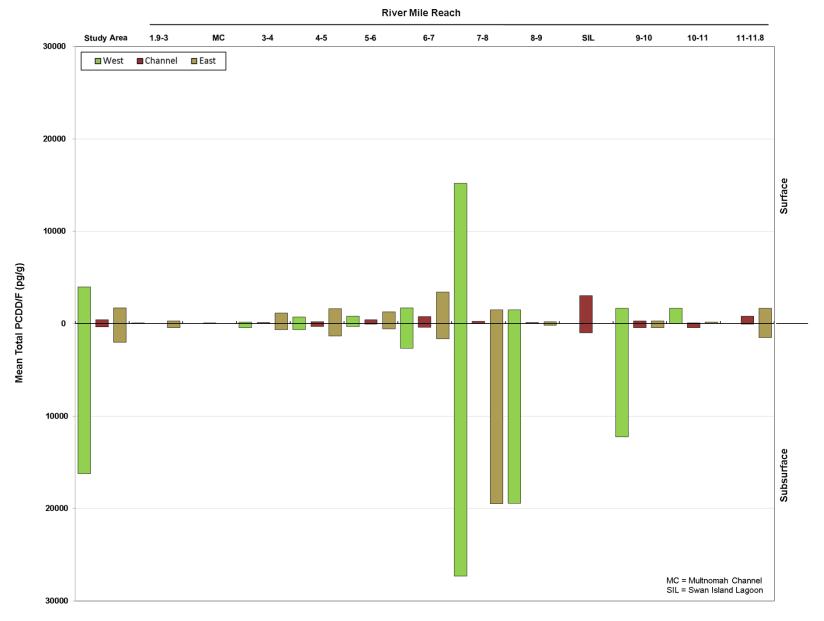


Figure 5.2-6
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Total PCDD/Fs Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

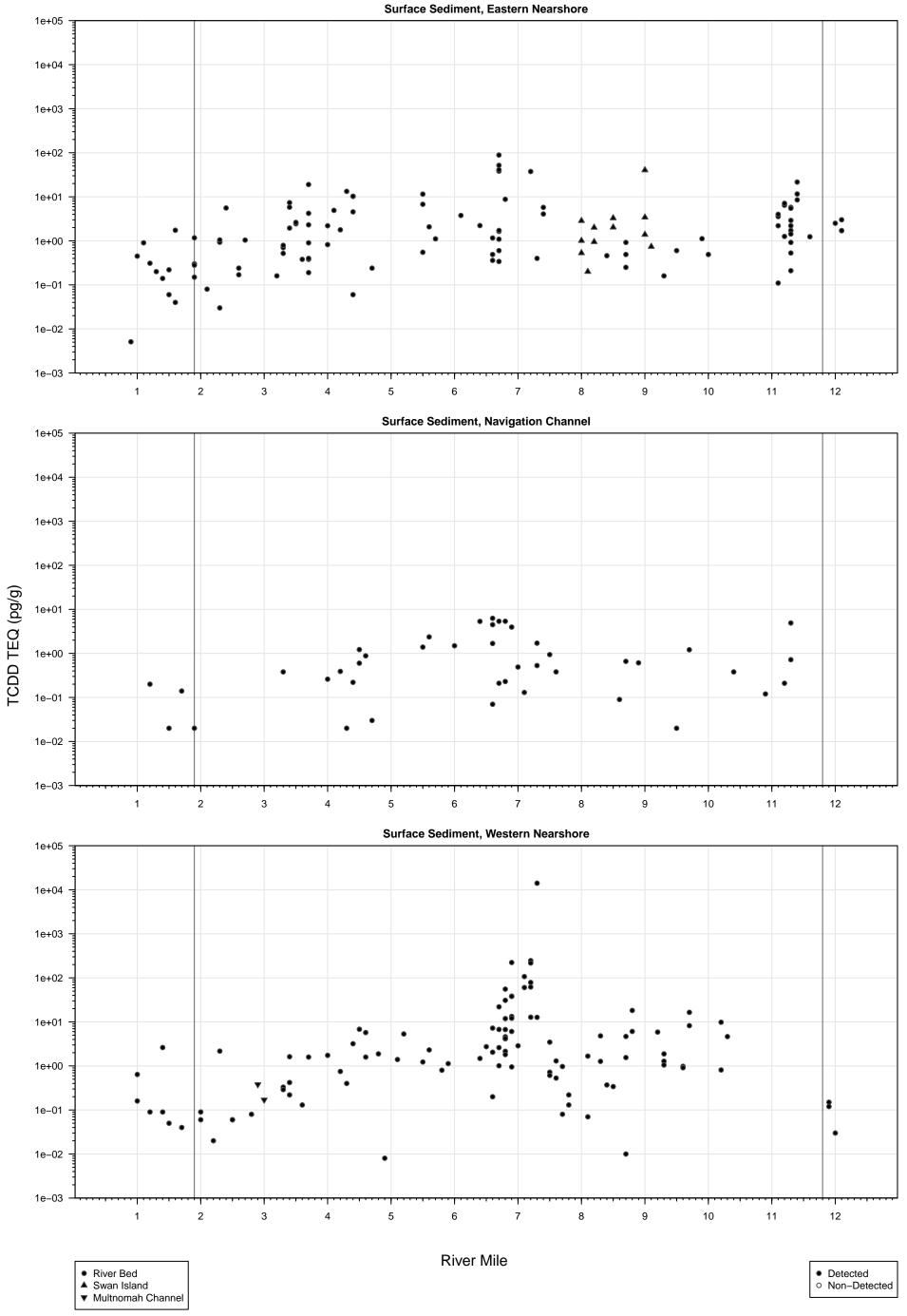


Figure 5.2–7
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of TCDD TEQ
Concentrations in Surface Sediment, RM 0.8–12.2

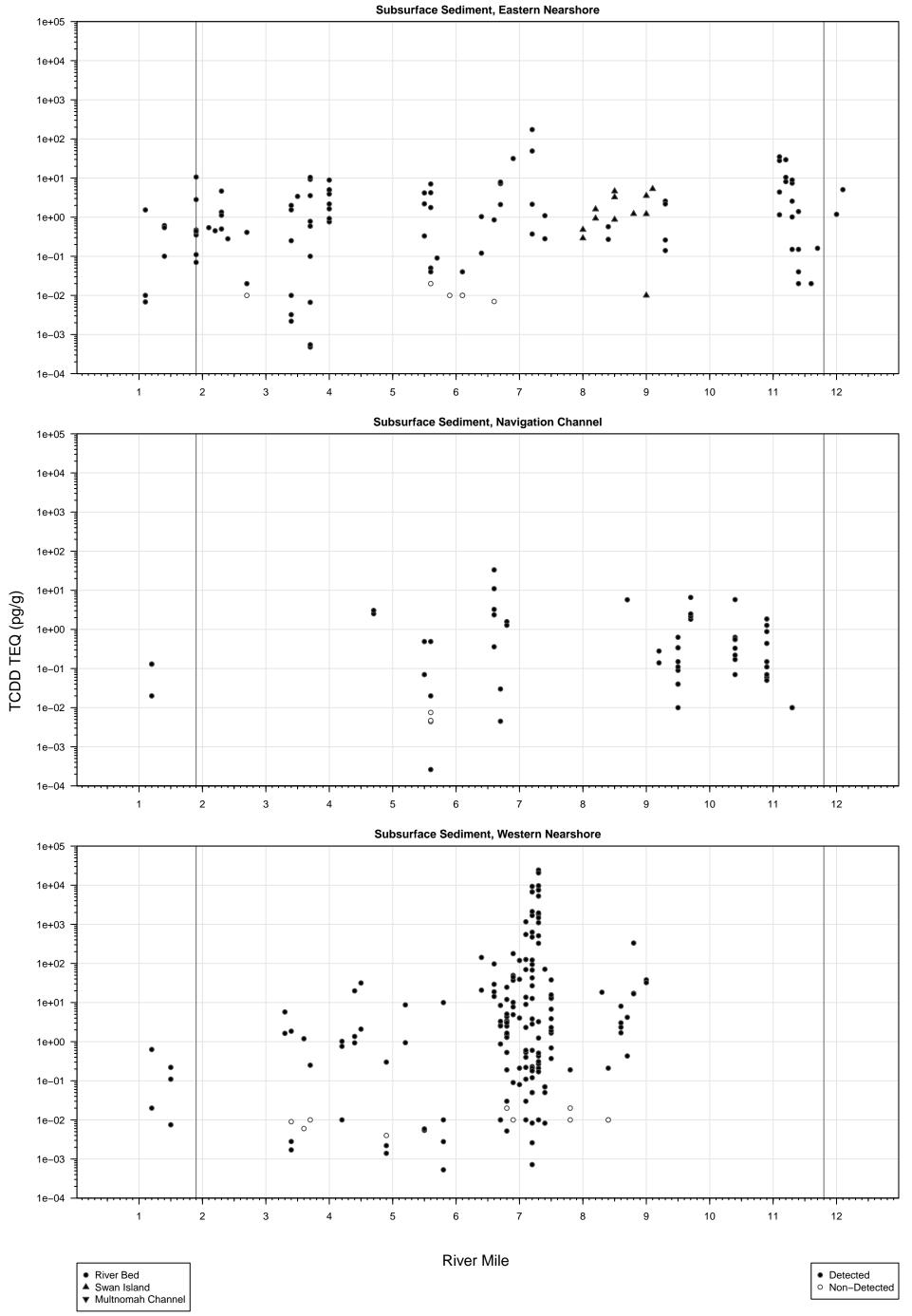


Figure 5.2-8
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of TCDD TEQ
Concentrations in Subsurface Sediment, RM 0.8-12.2

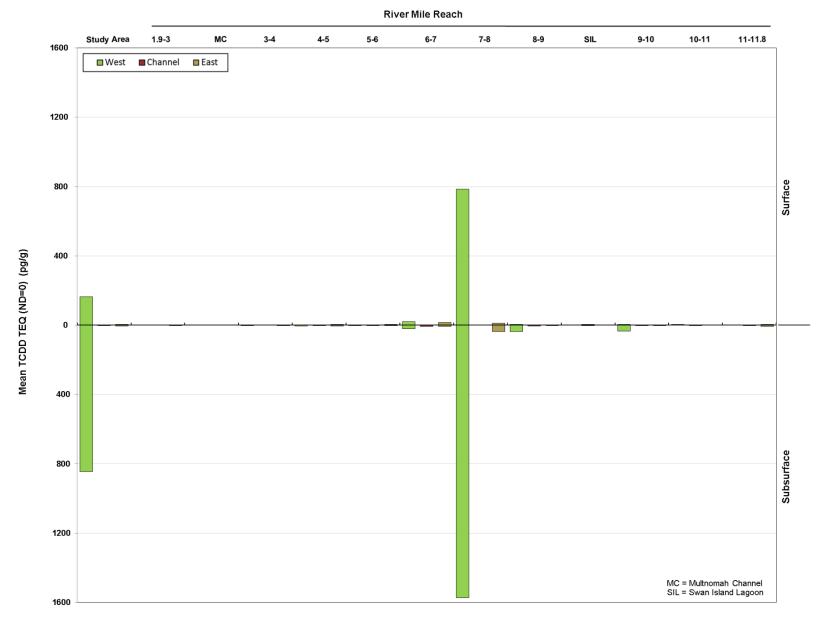


Figure 5.2-9
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean TCDD TEQ Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

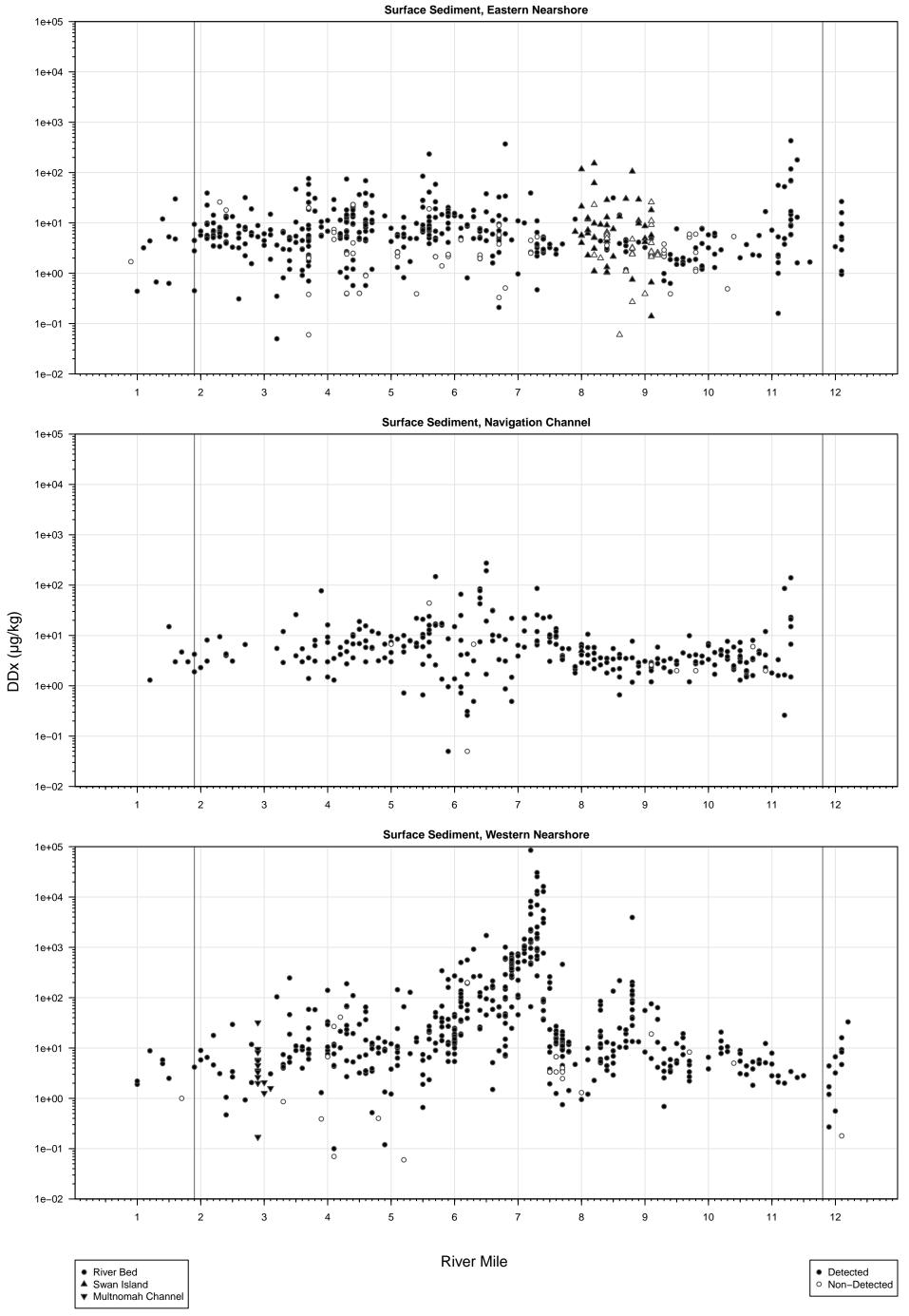


Figure 5.2–10
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx
Concentrations in Surface Sediment, RM 0.8–12.2

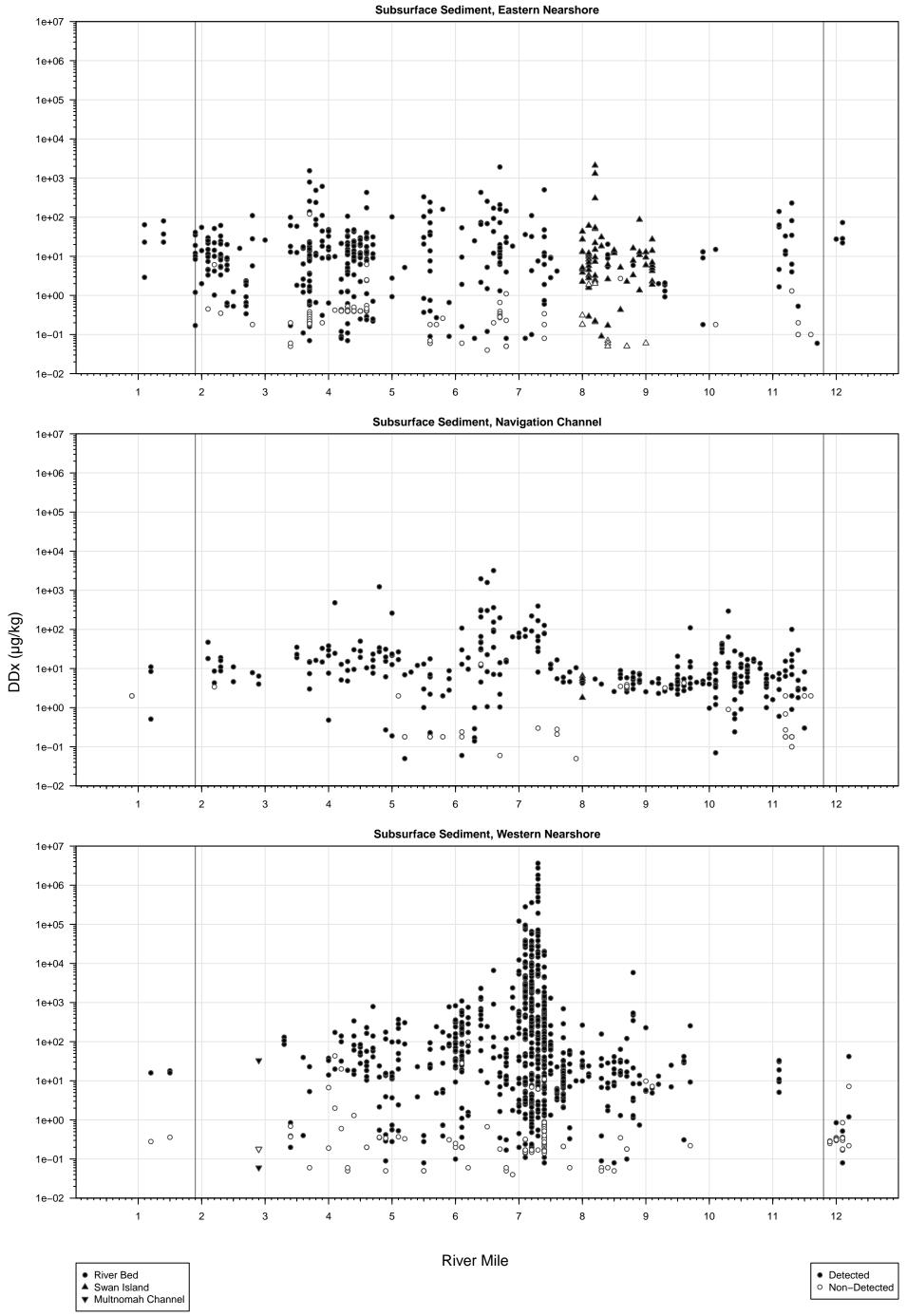


Figure 5.2–11
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx
Concentrations in Subsurface Sediment, RM 0.8–12.2

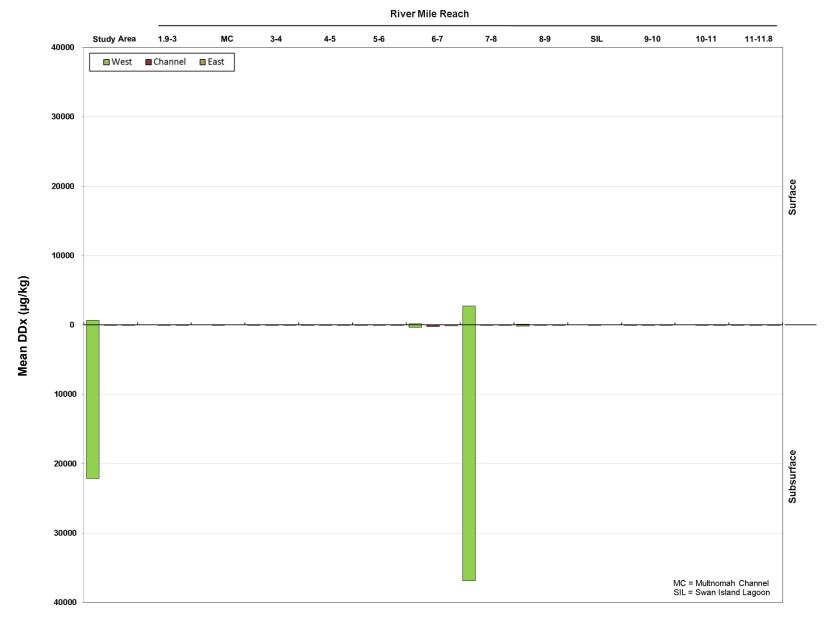


Figure 5.2-12
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean DDx Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

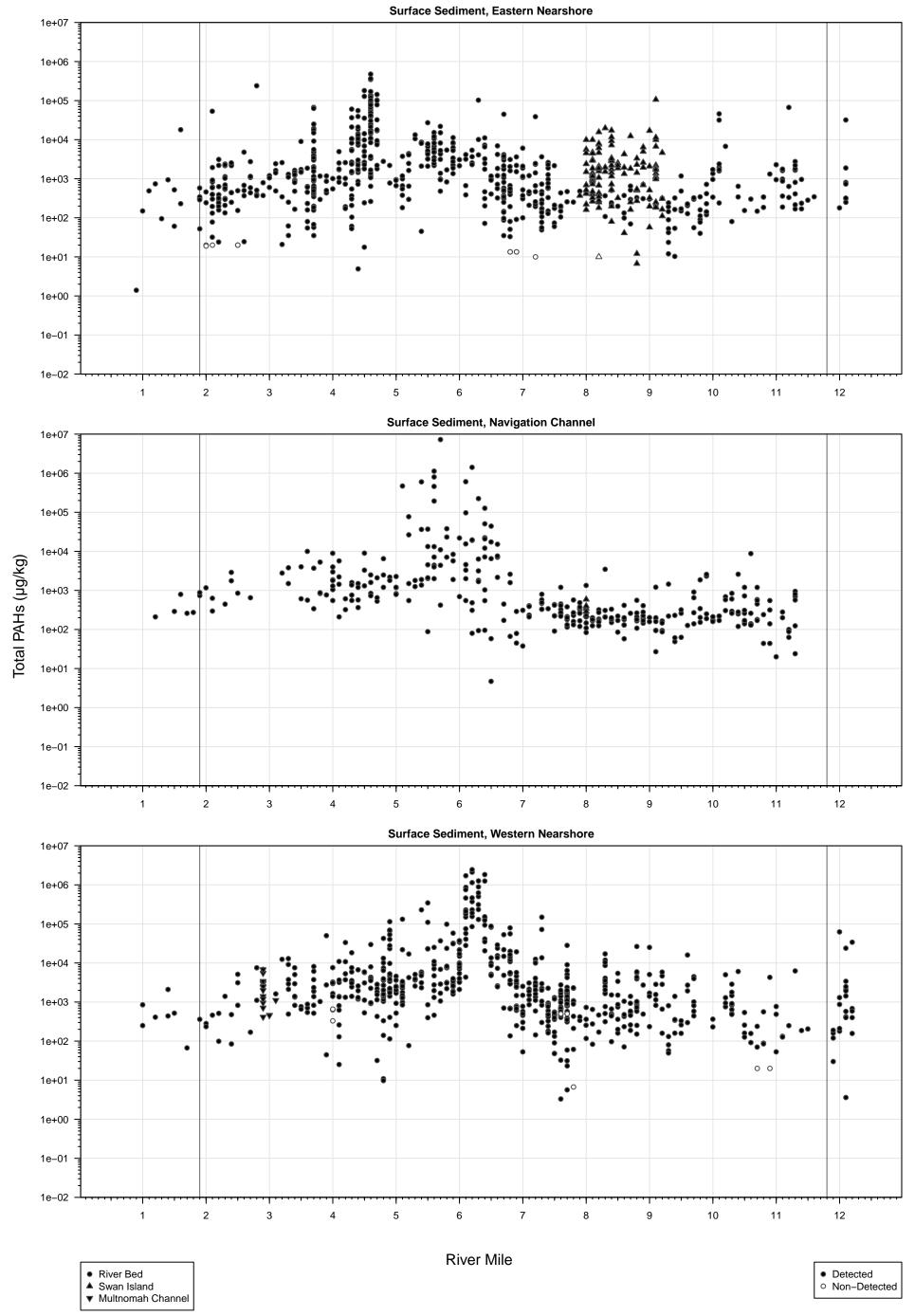


Figure 5.2–13
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PAHs
Concentrations in Surface Sediment, RM 0.8–12.2

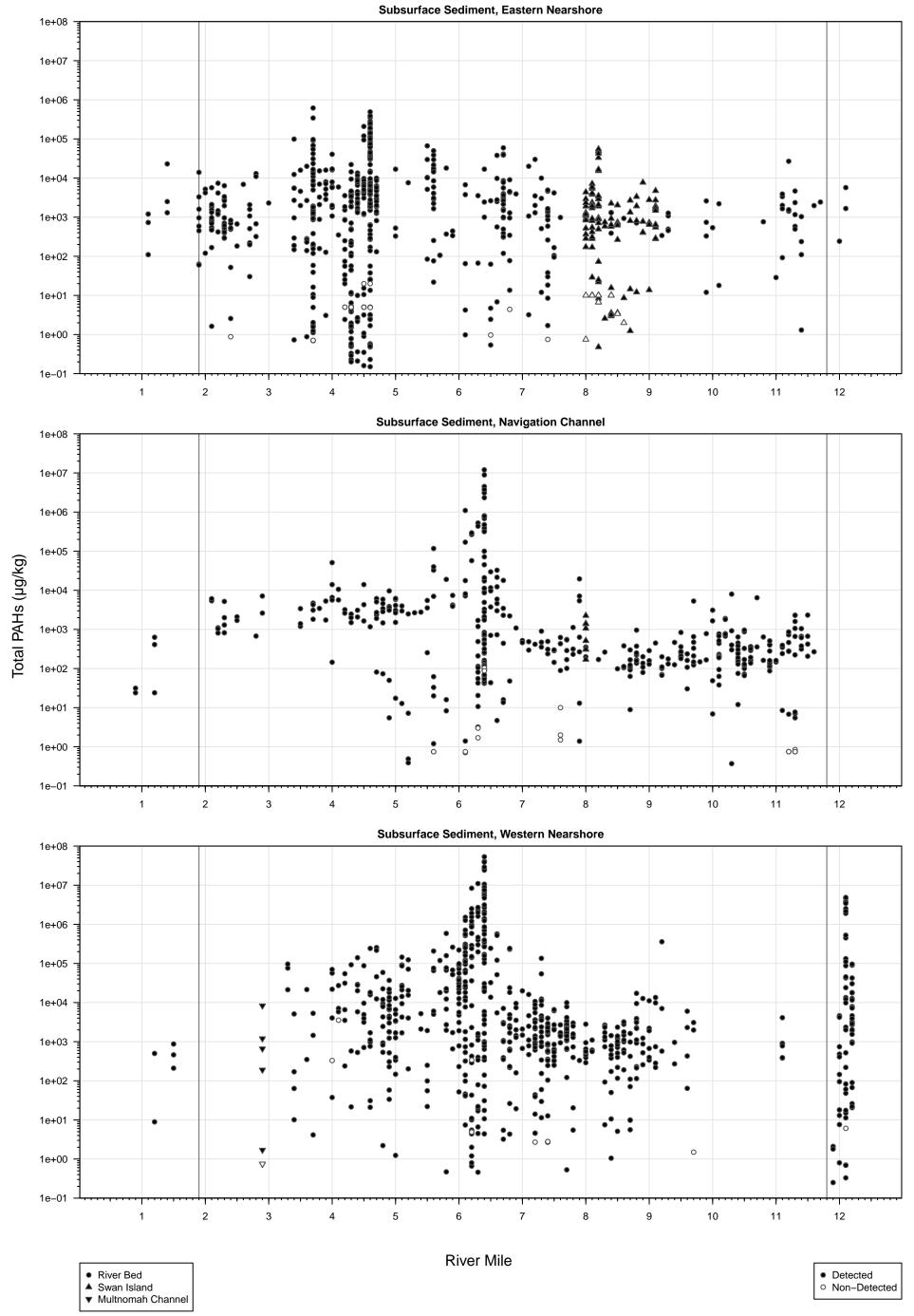


Figure 5.2–14
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PAHs
Concentrations in Subsurface Sediment, RM 0.8–12.2

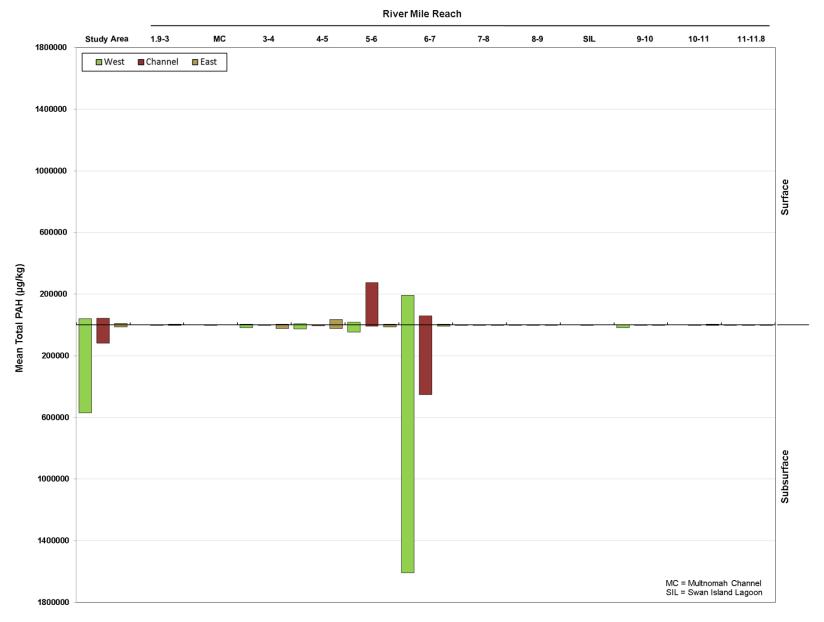


Figure 5.2-15
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Total PAHs Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

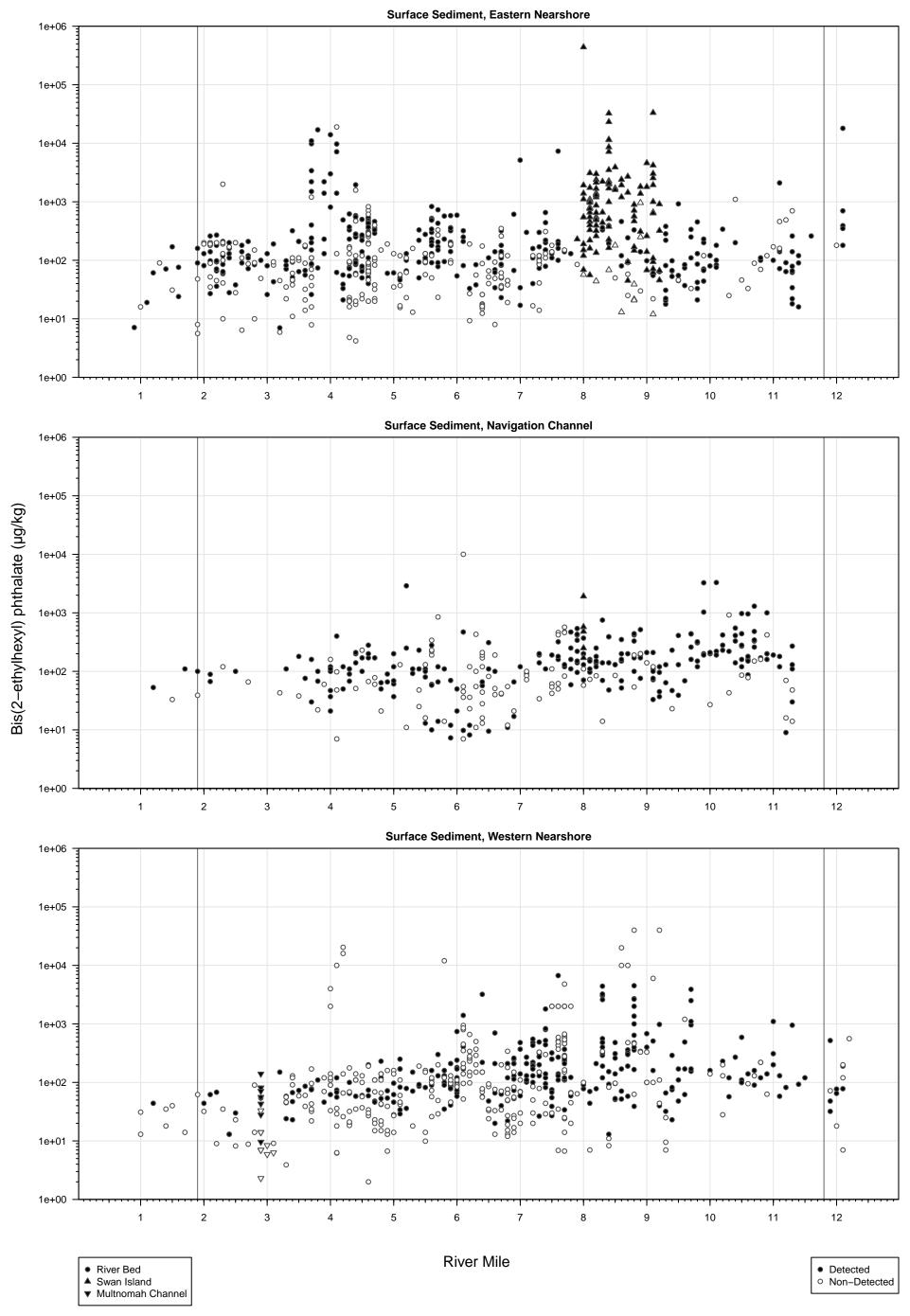


Figure 5.2–16
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Bis(2–ethylhexyl)phthalate
Concentrations in Surface Sediment, RM 0.8–12.2

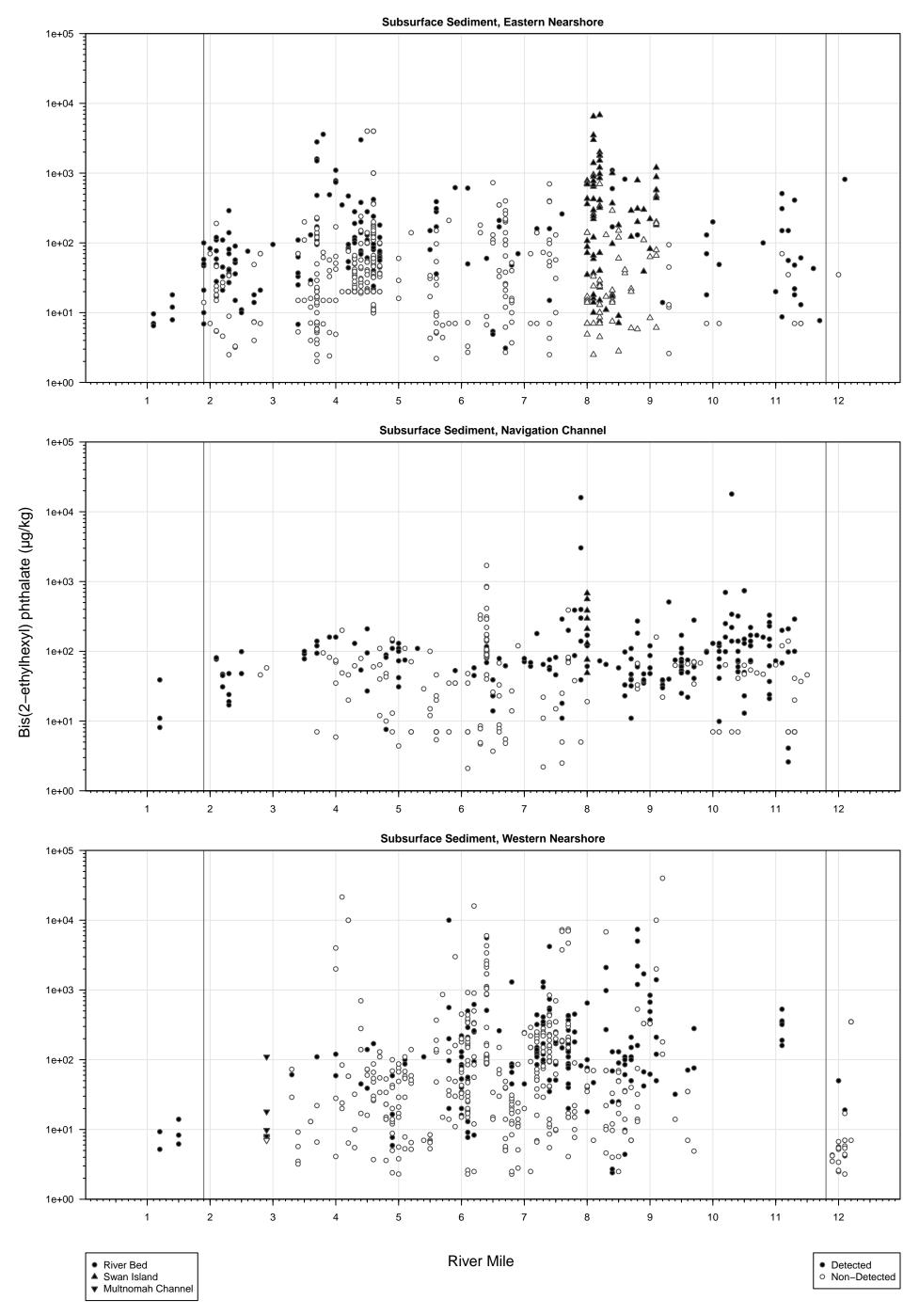


Figure 5.2–17
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Bis(2–ethylhexyl)phthalate
Concentrations in Subsurface Sediment, RM 0.8–12.2

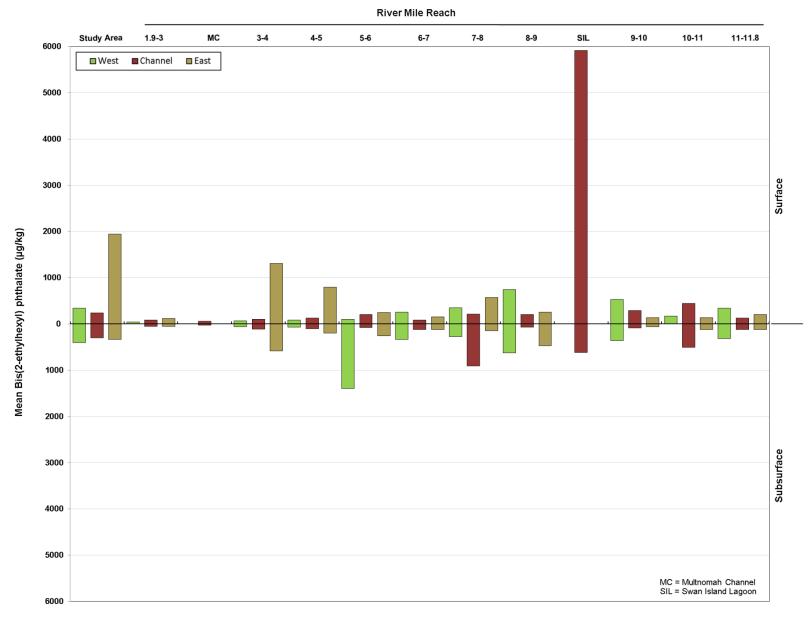


Figure 5.2-18
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Bis(2-ethylhexyl) phthalate Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

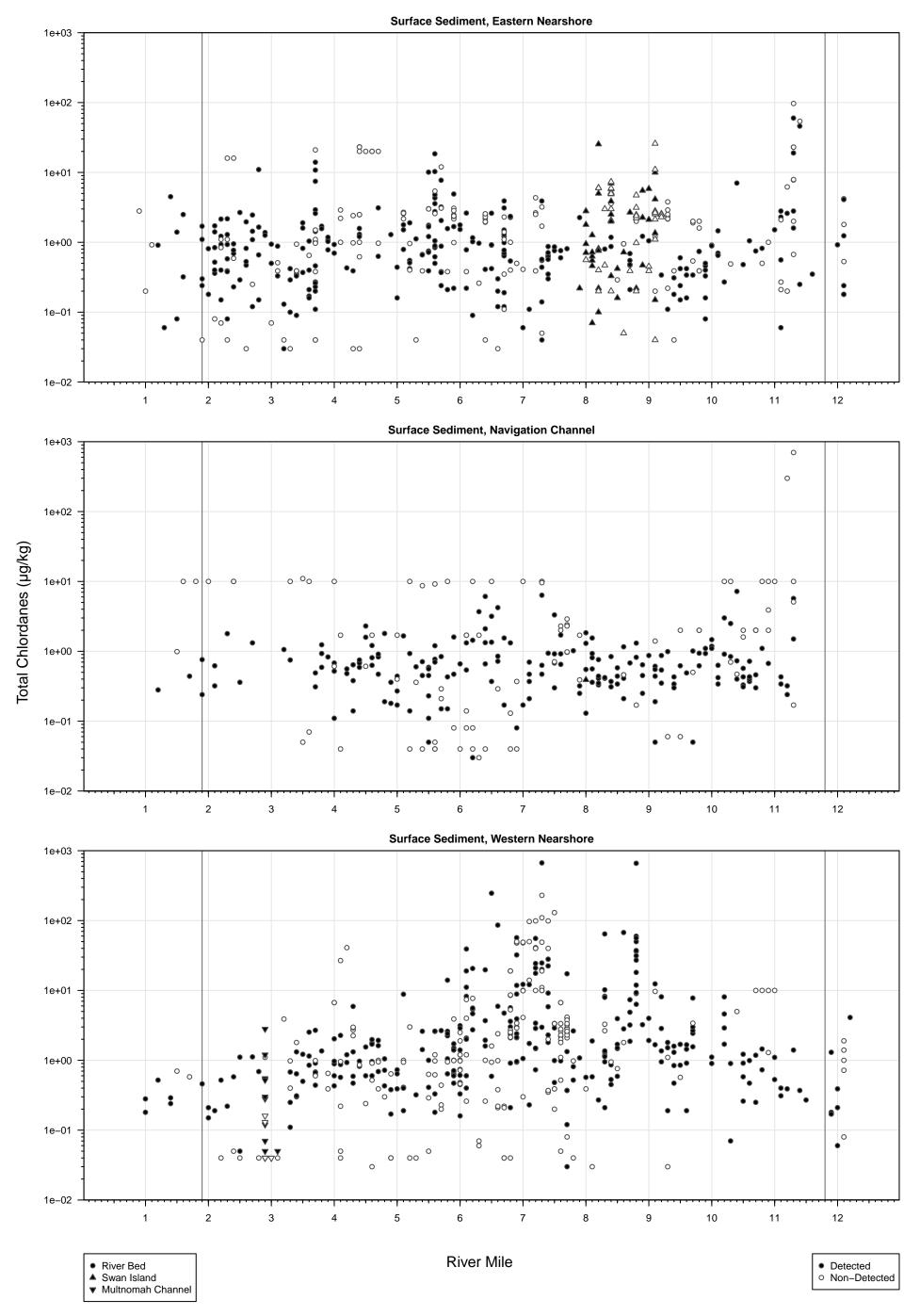


Figure 5.2–19
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total Chlordanes
Concentrations in Surface Sediment, RM 0.8–12.2

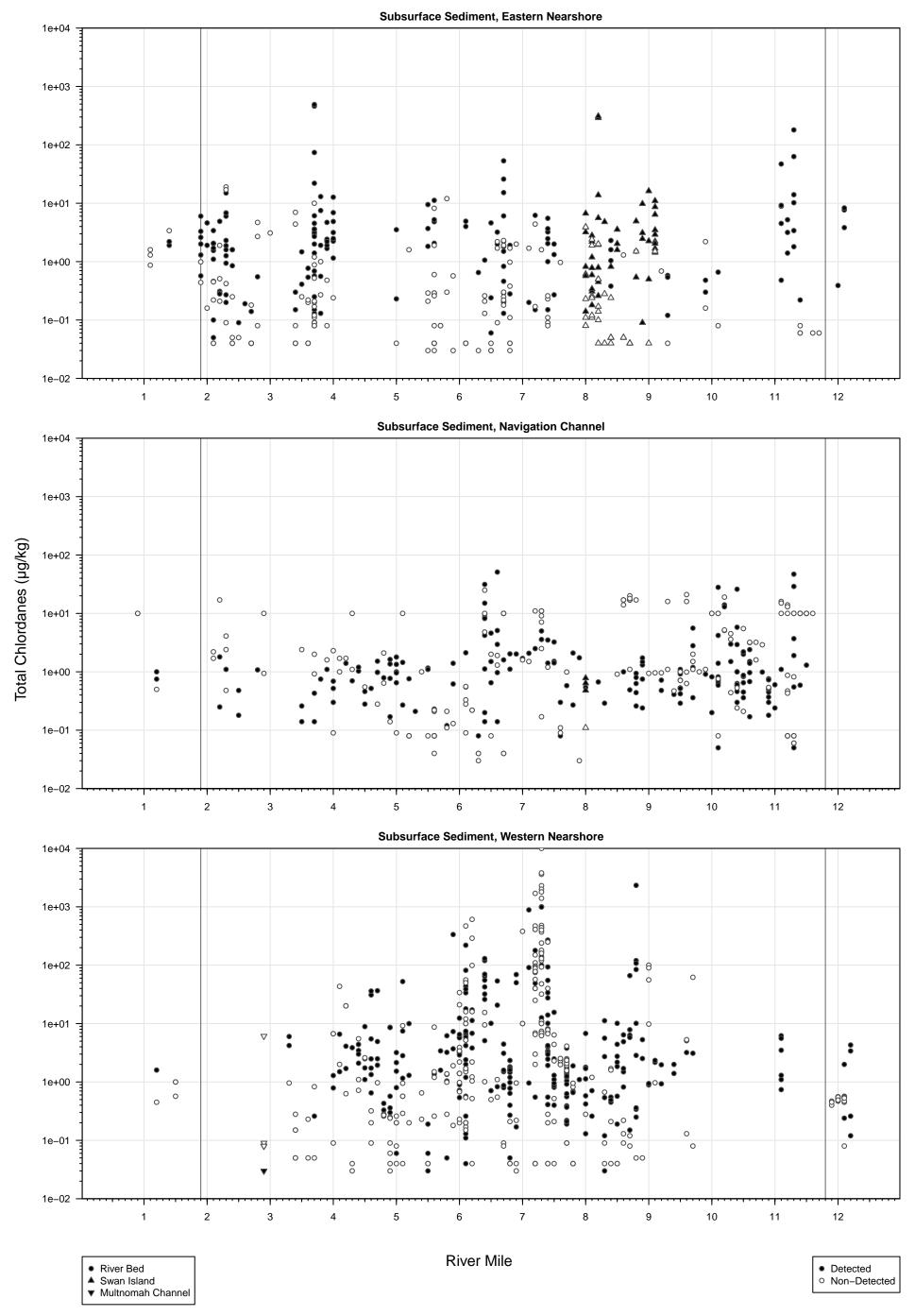


Figure 5.2–20
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total Chlordanes
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-21
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Total Chlordanes Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

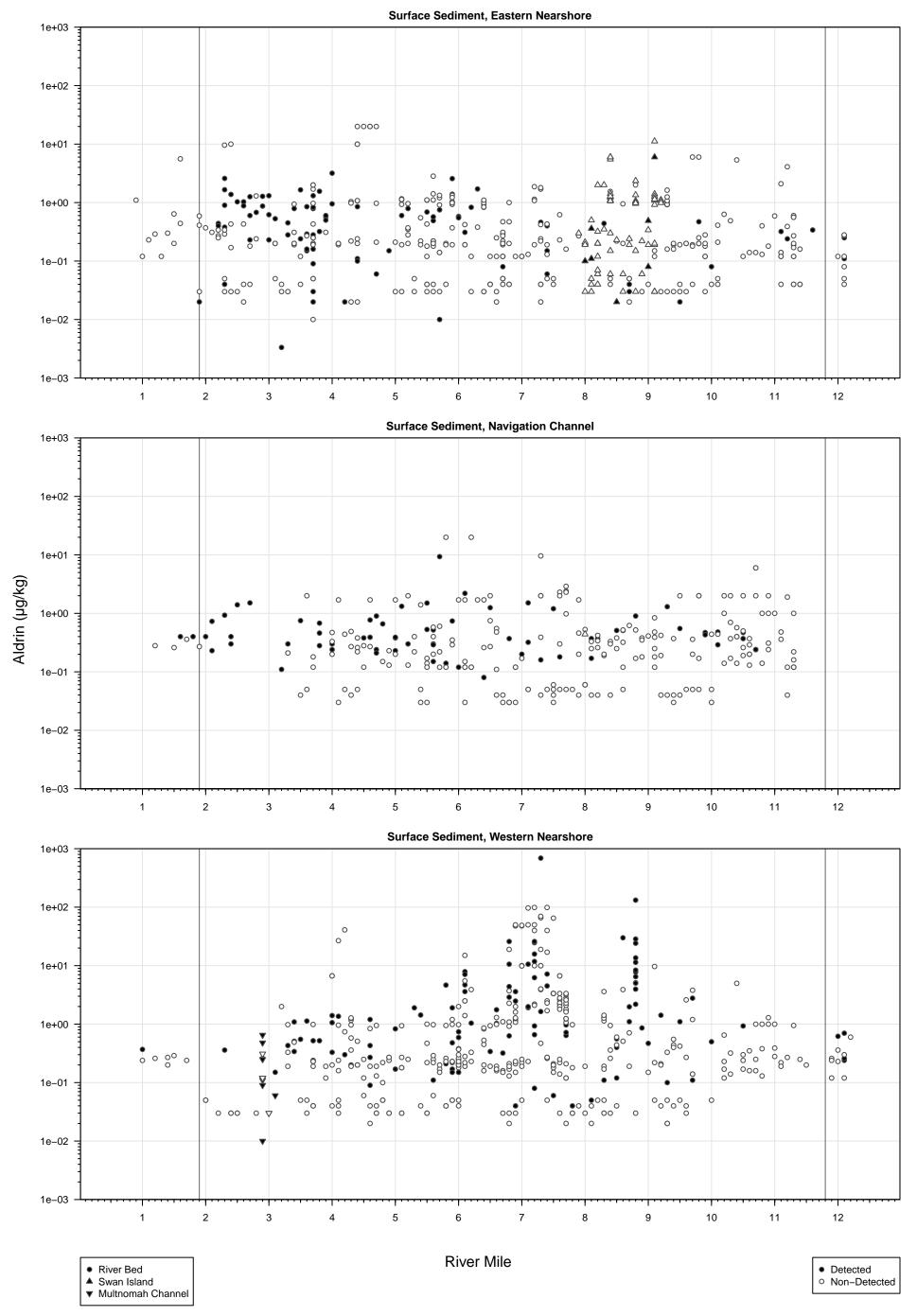


Figure 5.2–22
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Aldrin
Concentrations in Surface Sediment, RM 0.8–12.2

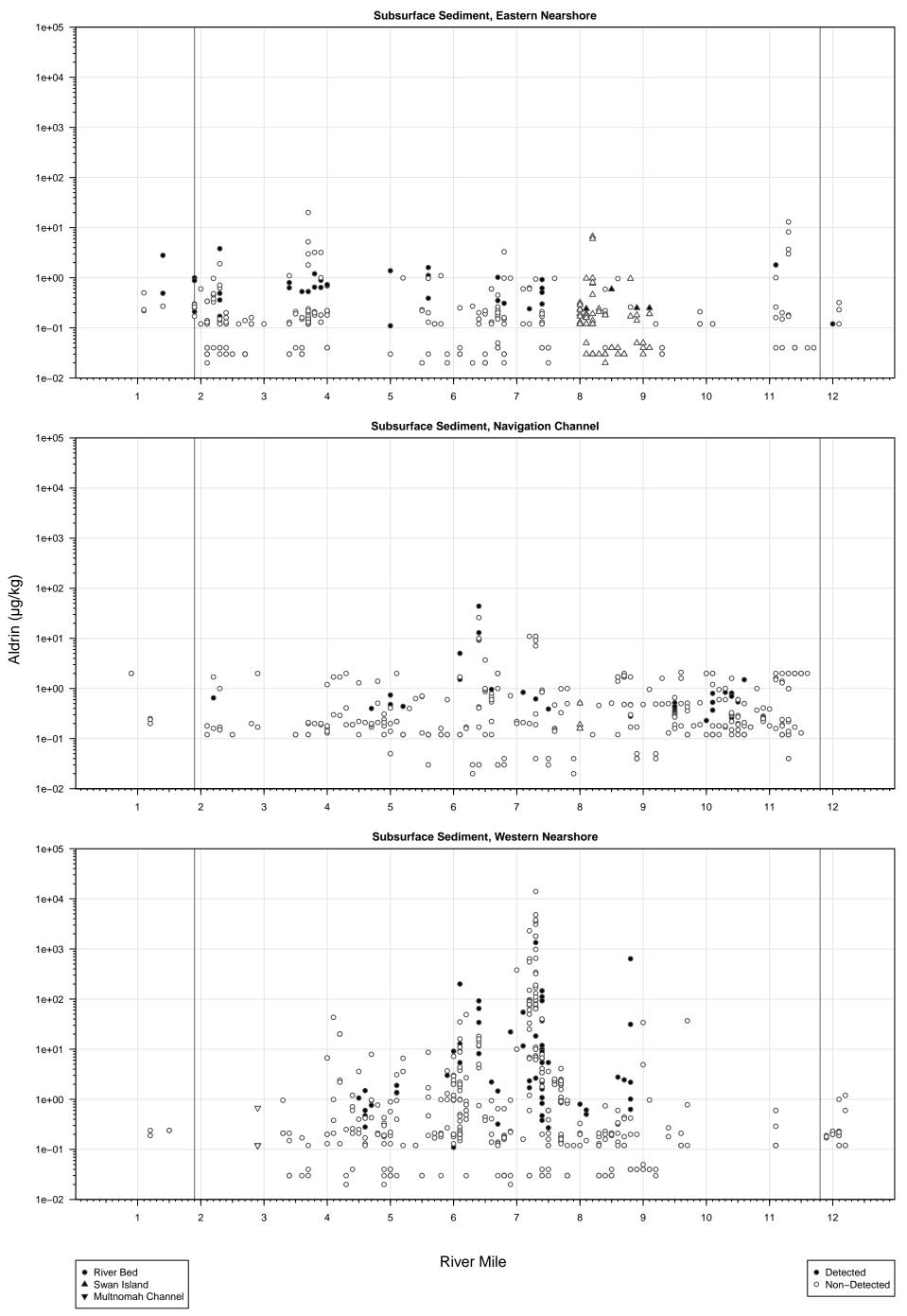


Figure 5.2–23
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Aldrin
Concentrations in Subsurface Sediment, RM 0.8–12.2

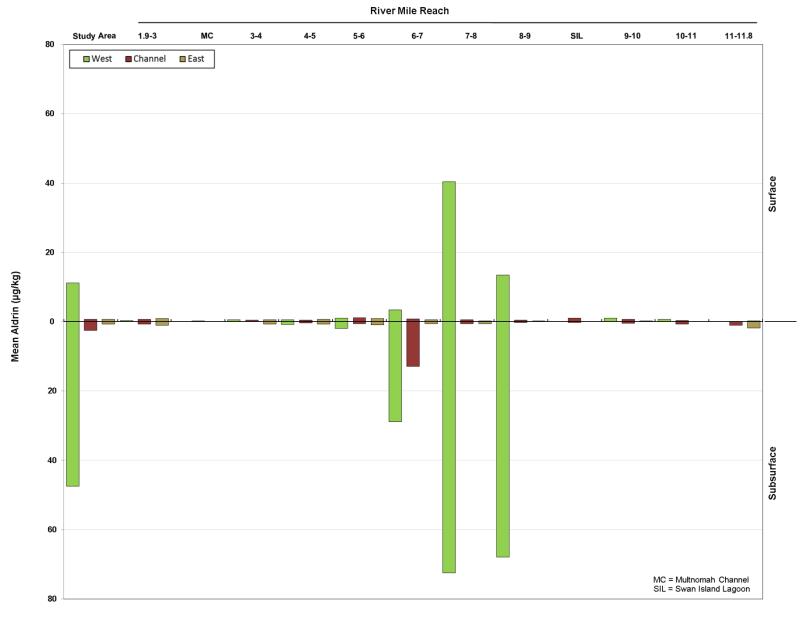


Figure 5.2-24
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Aldrin Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

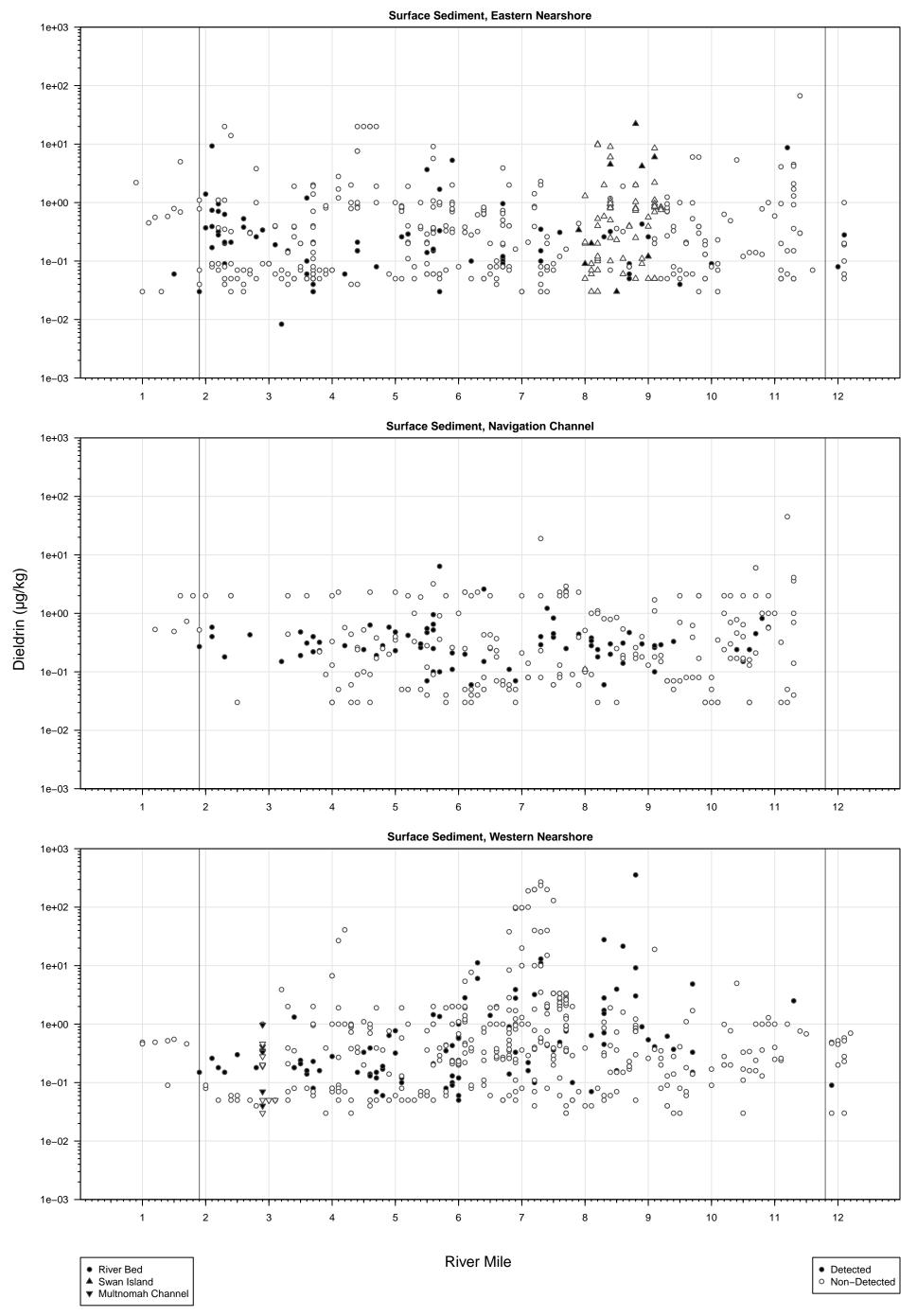


Figure 5.2–25
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Dieldrin
Concentrations in Surface Sediment, RM 0.8–12.2

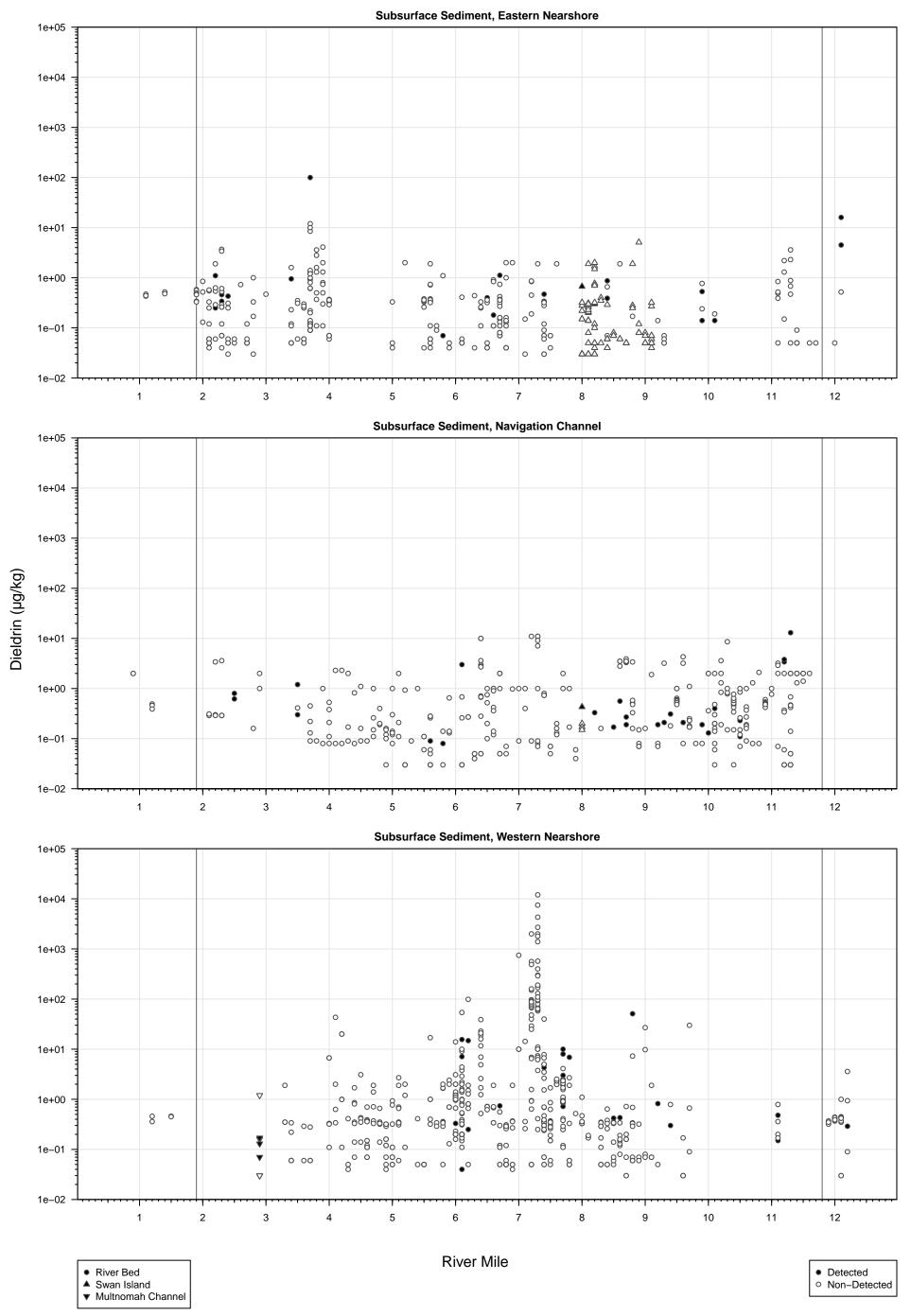


Figure 5.2–26
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Dieldrin
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-27
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Dieldrin Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

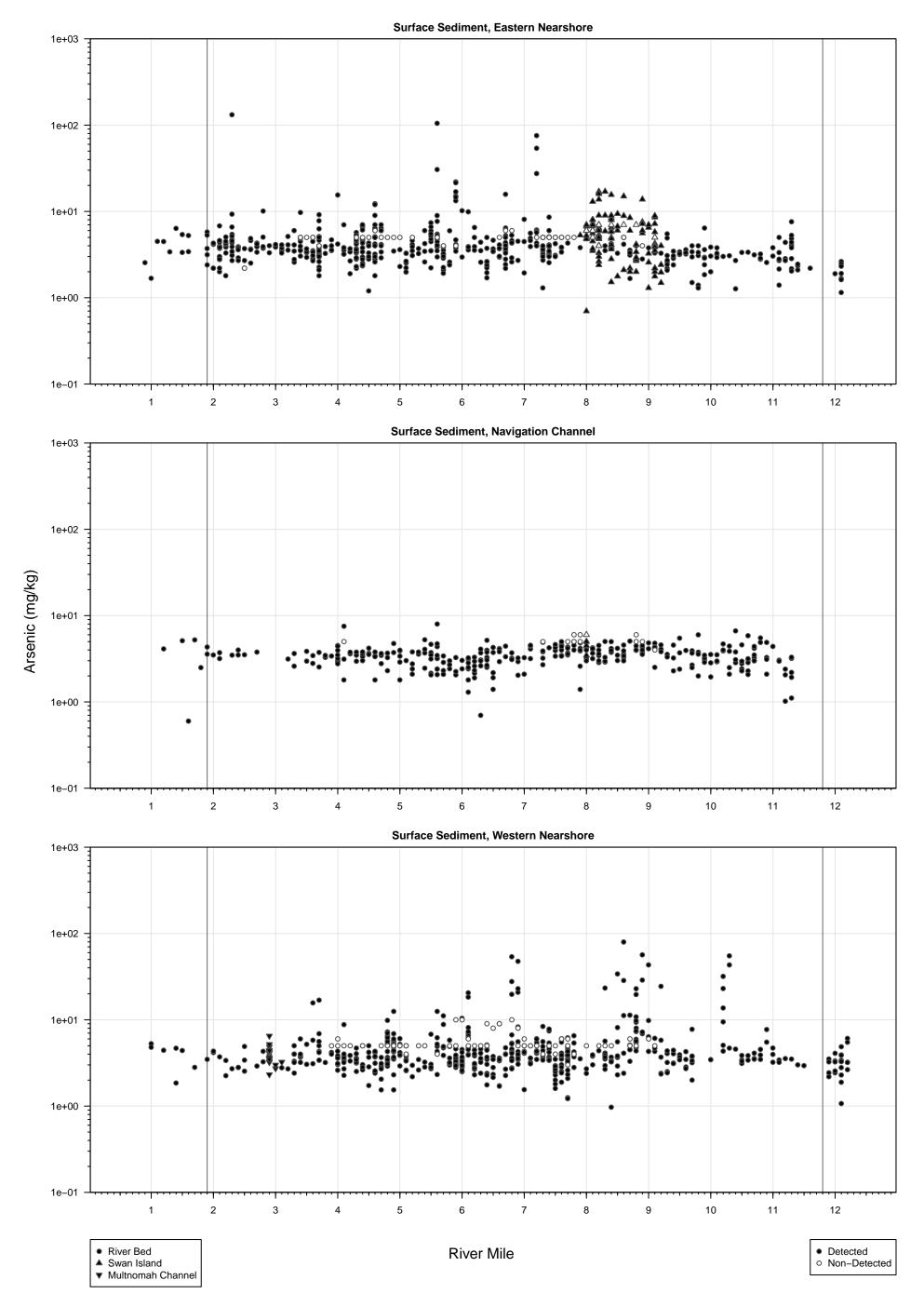


Figure 5.2–28
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Arsenic
Concentrations in Surface Sediment, RM 0.8–12.2

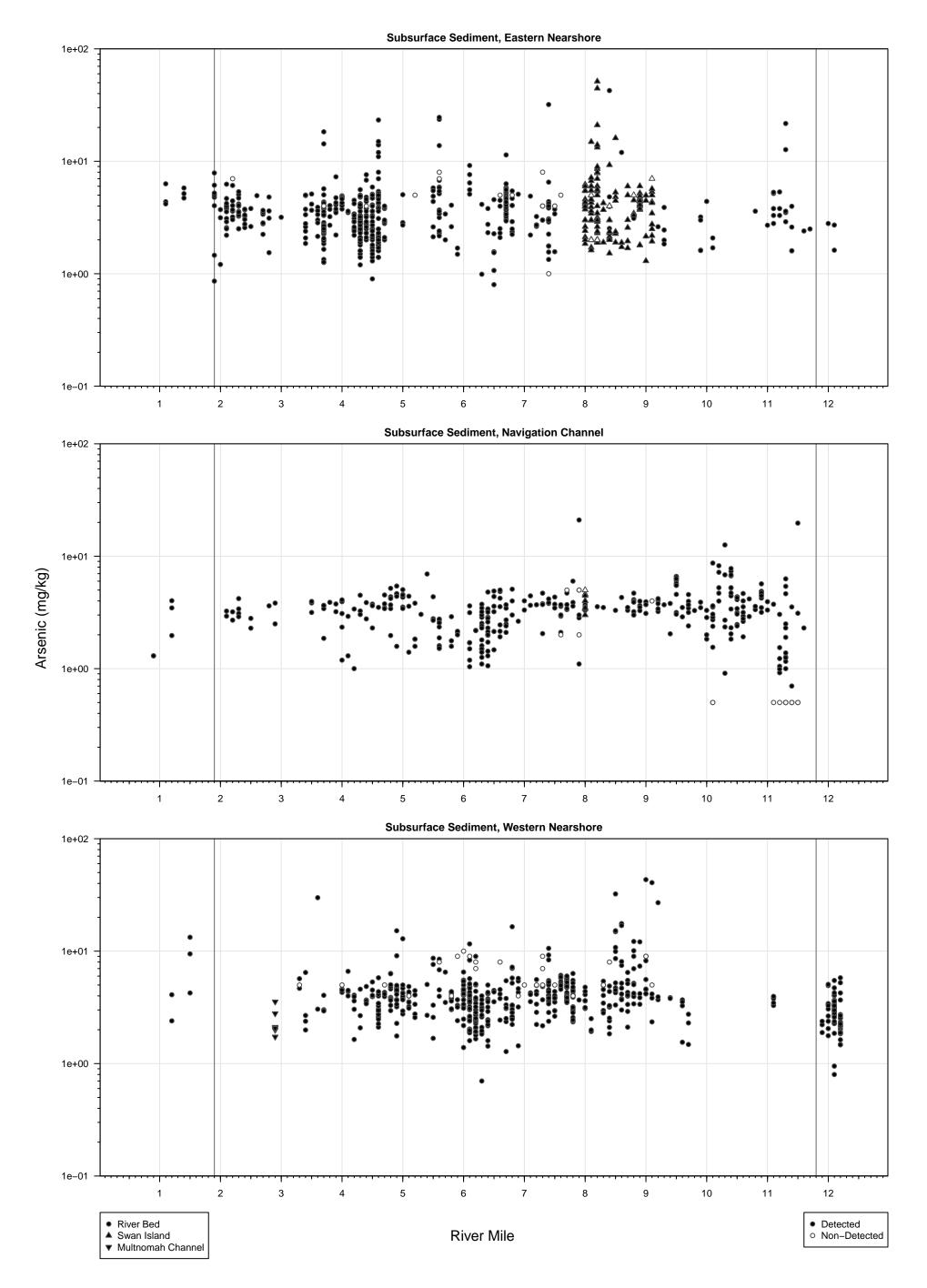


Figure 5.2–29
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Arsenic
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-30
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Arsenic Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

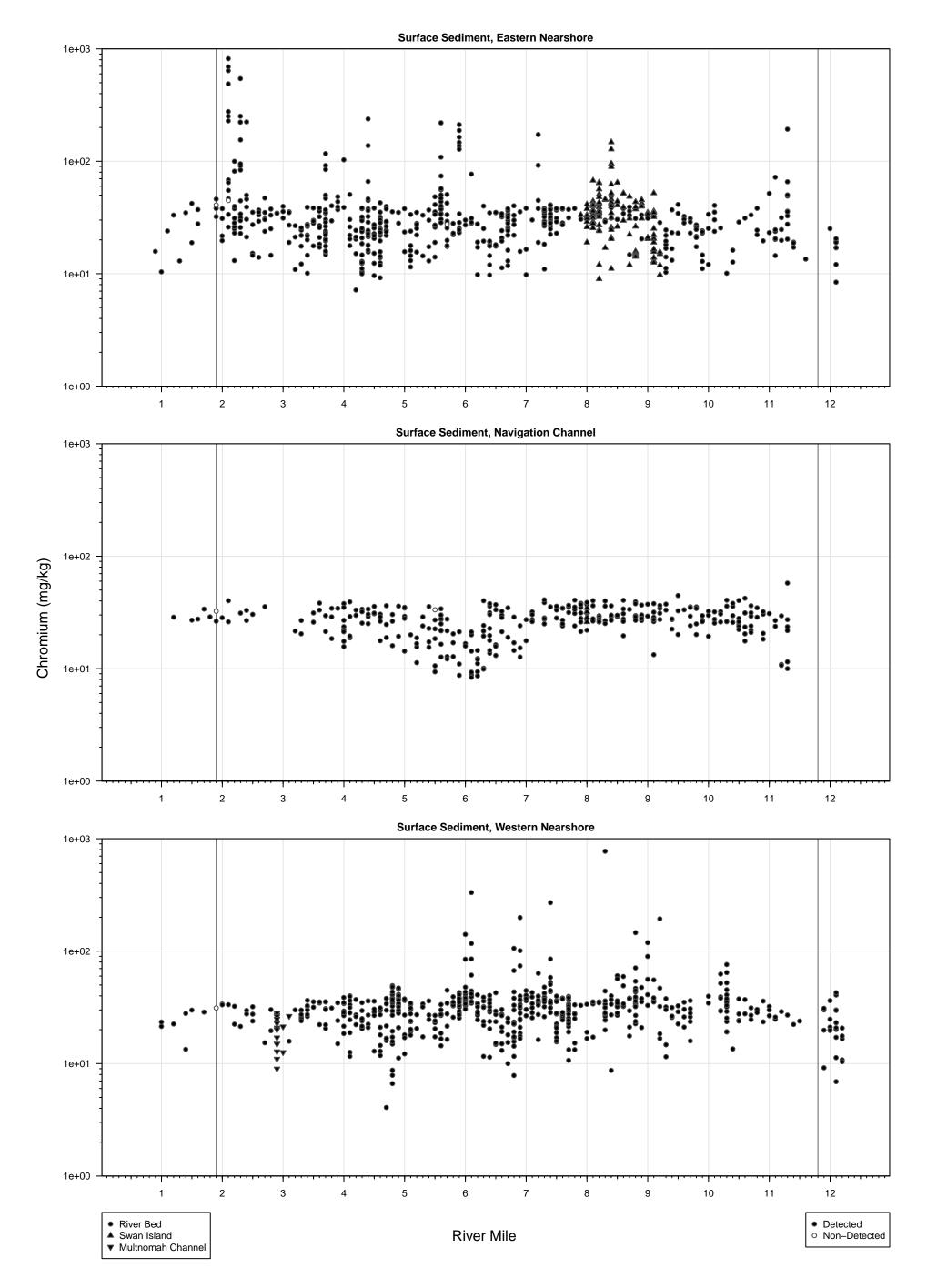


Figure 5.2–31
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Chromium
Concentrations in Surface Sediment, RM 0.8–12.2

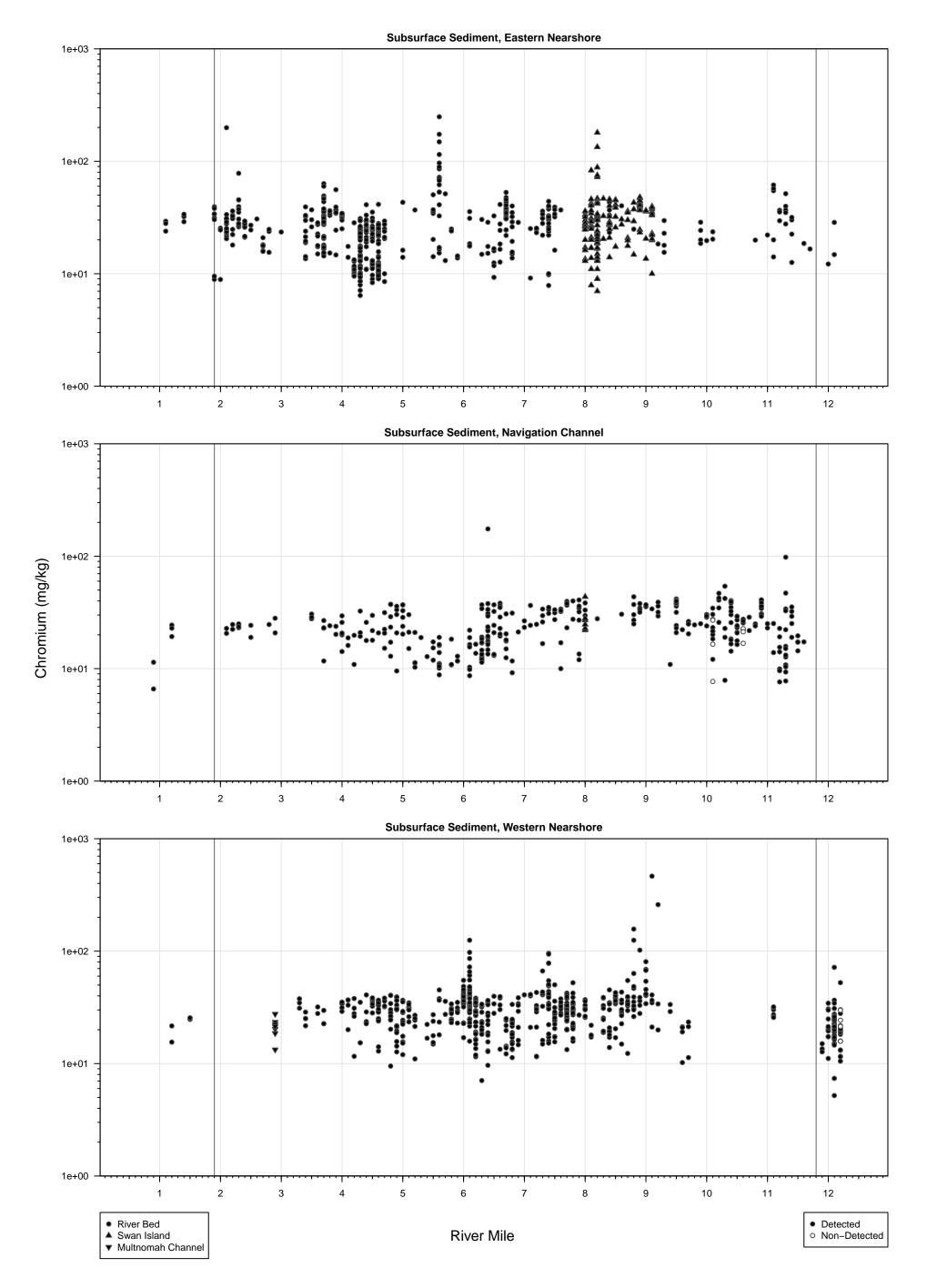


Figure 5.2–32
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Chromium
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-33
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Chromium Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

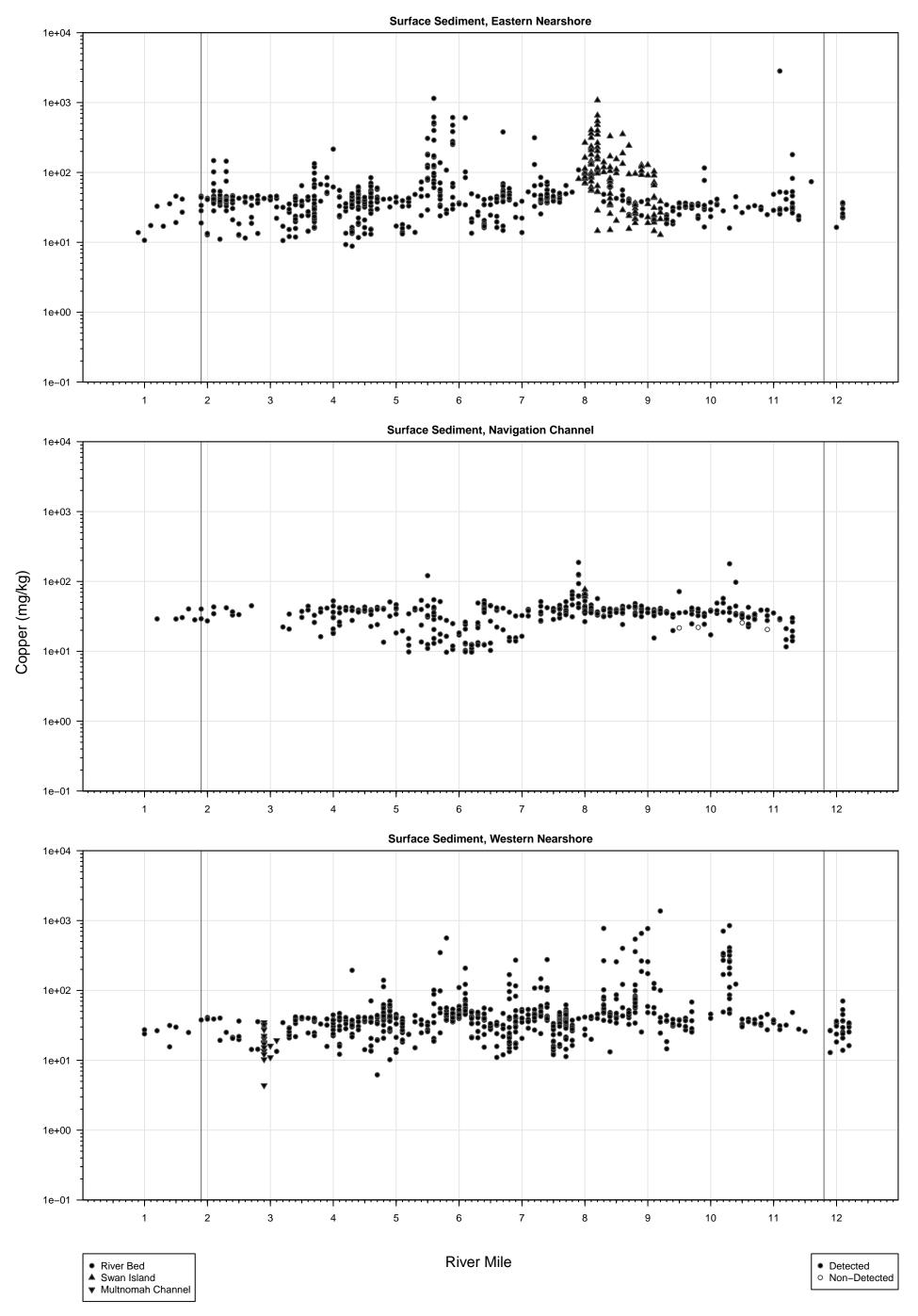


Figure 5.2–34
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Copper
Concentrations in Surface Sediment, RM 0.8–12.2

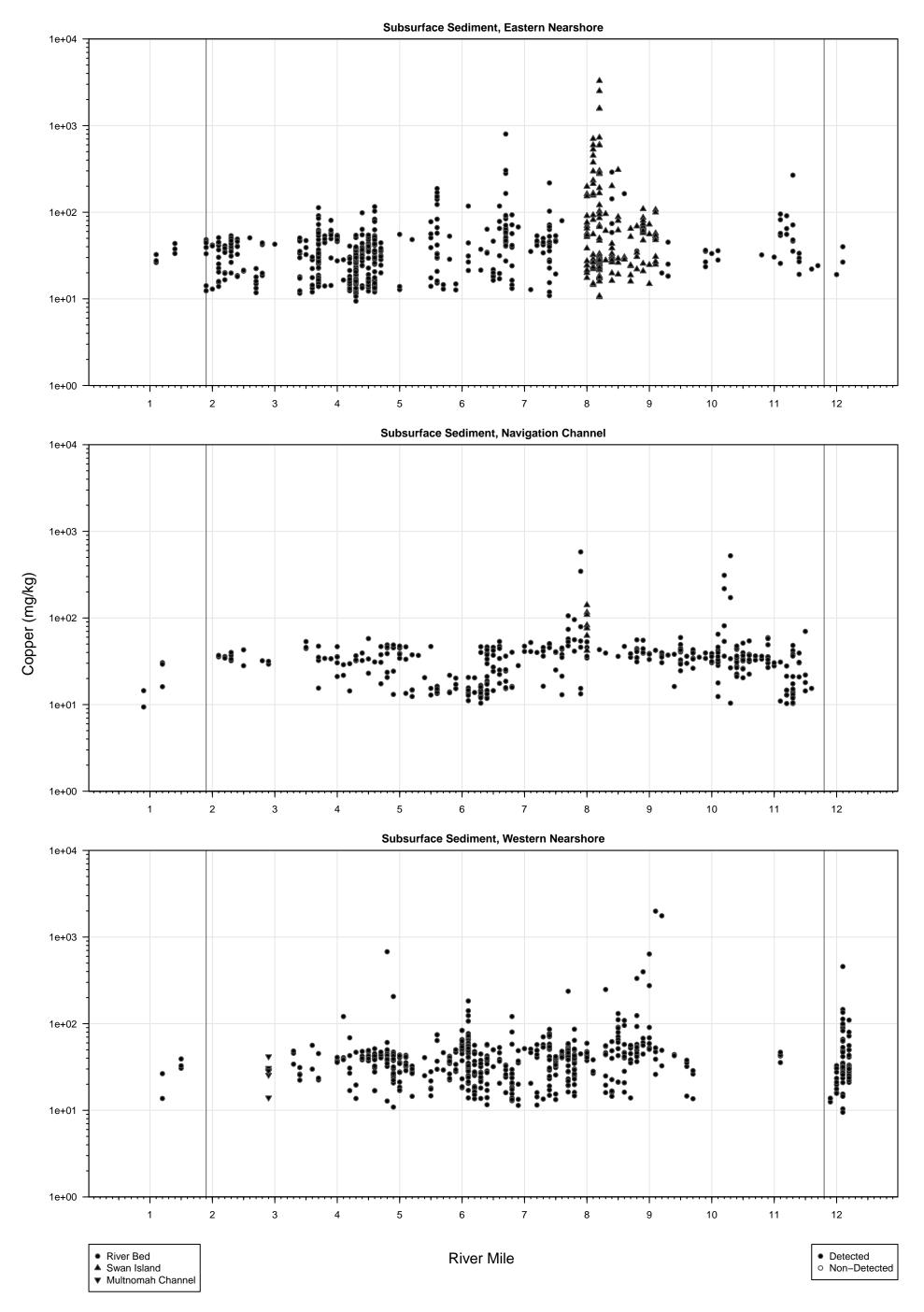


Figure 5.2–35
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Copper
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-36
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Copper Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

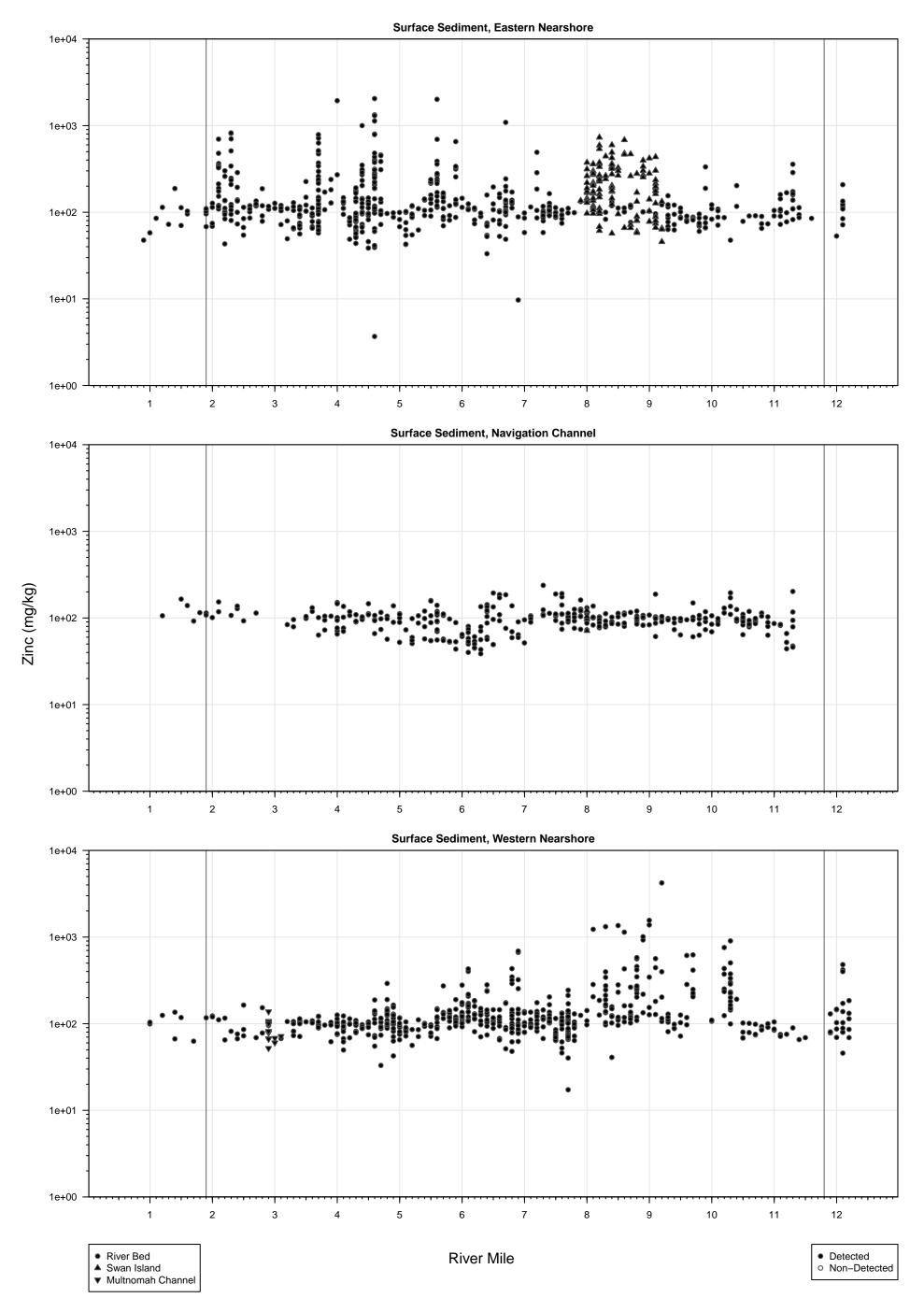


Figure 5.2–37
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Zinc
Concentrations in Surface Sediment, RM 0.8–12.2

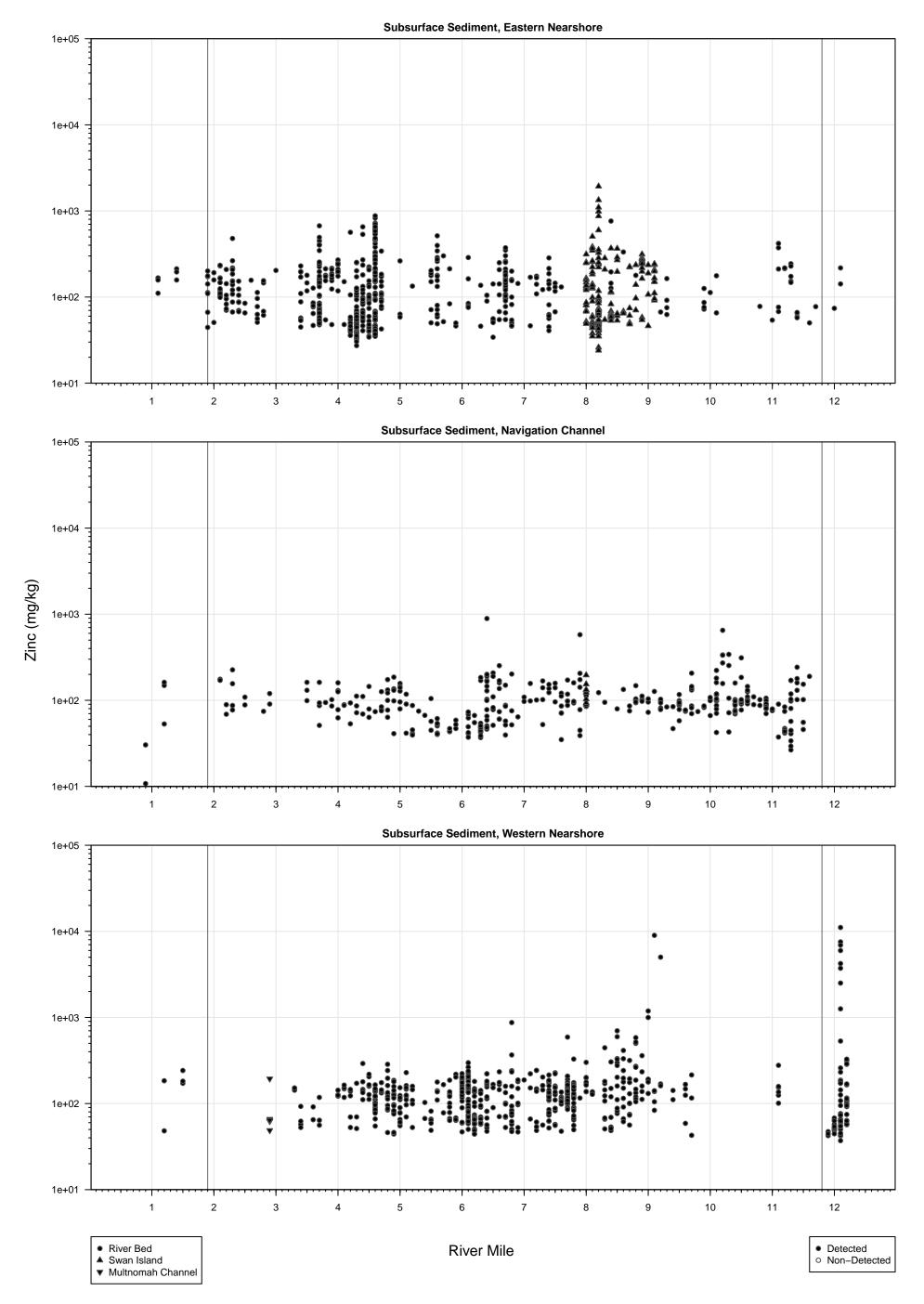


Figure 5.2–38
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Zinc
Concentrations in Subsurface Sediment, RM 0.8–12.2



Figure 5.2-39
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Zinc Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

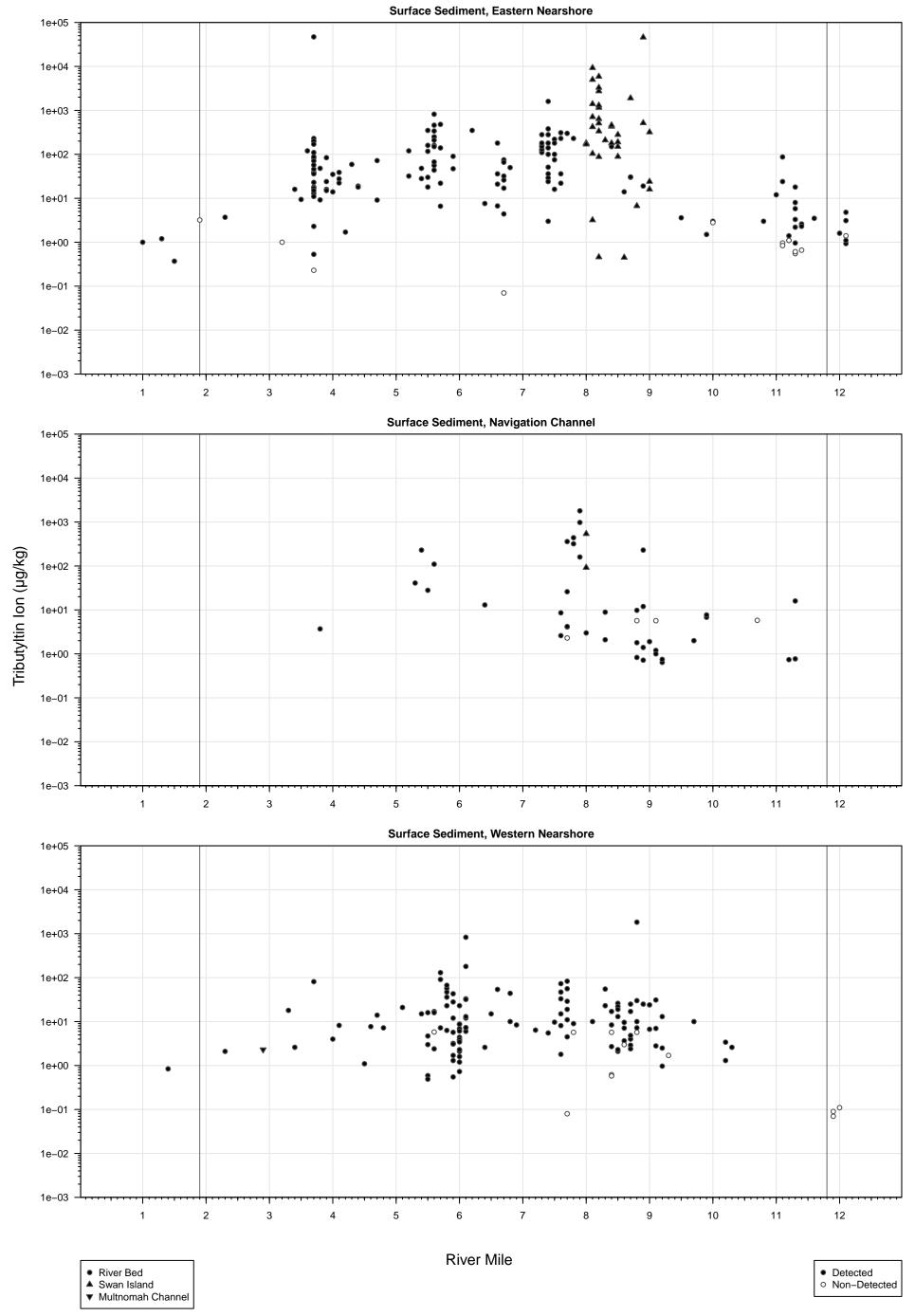


Figure 5.2–40
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Tributyltin Ion
Concentrations in Surface Sediment, RM 0.8–12.2

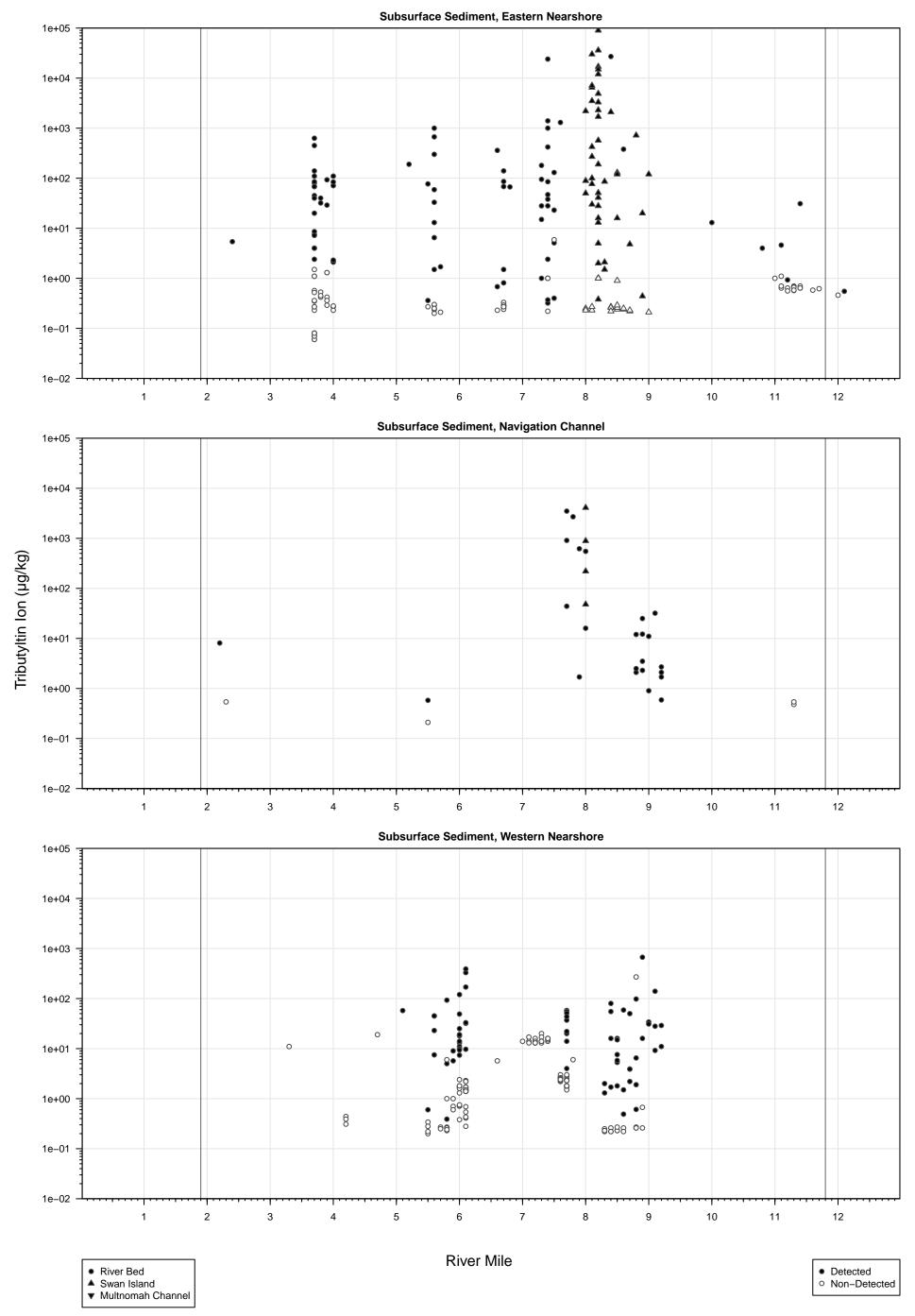


Figure 5.2–41
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Tributyltin Ion
Concentrations in Subsurface Sediment, RM 0.8–12.2

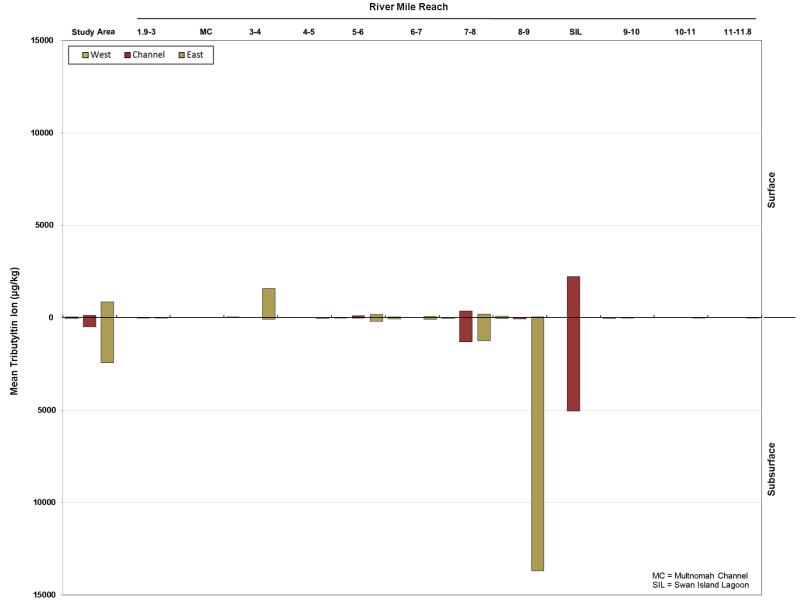


Figure 5.2-42
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Mean Tributyltin Ion Concentration
in Surface and Subsurface Sediment (RM 1.9–11.8)

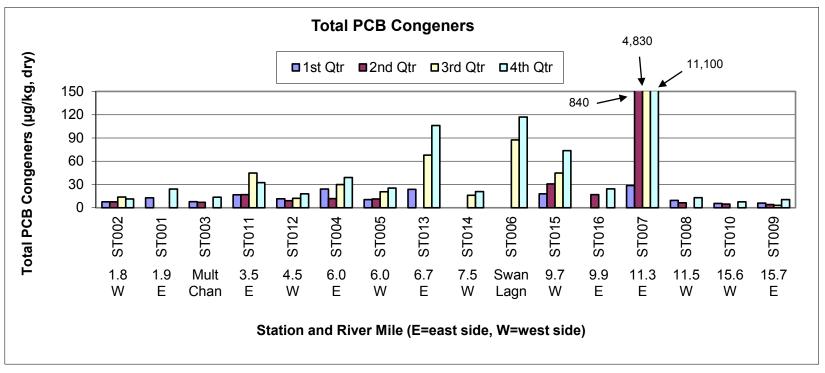


Figure 5.3-1a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCB Congener Concentrations
for In-River Sediment Traps, 2007

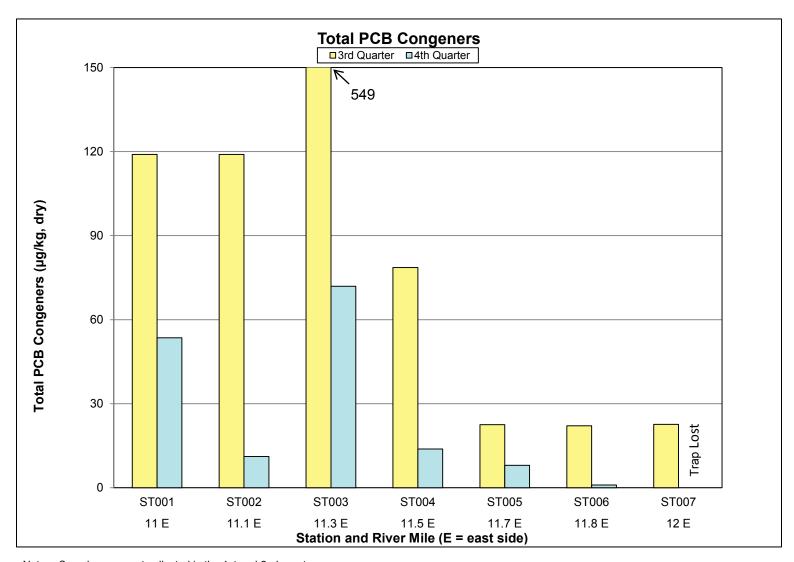
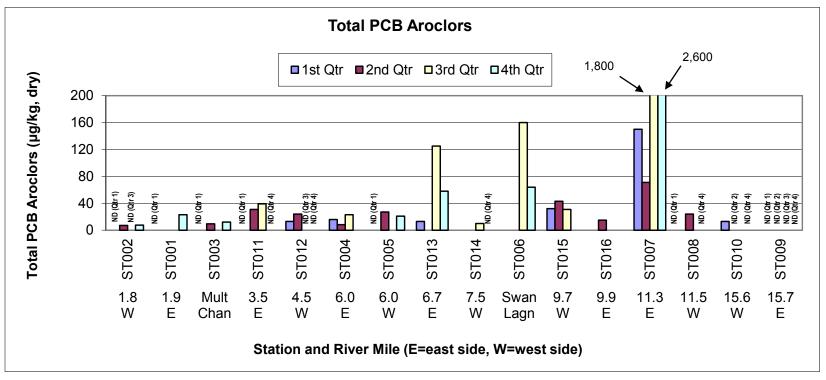
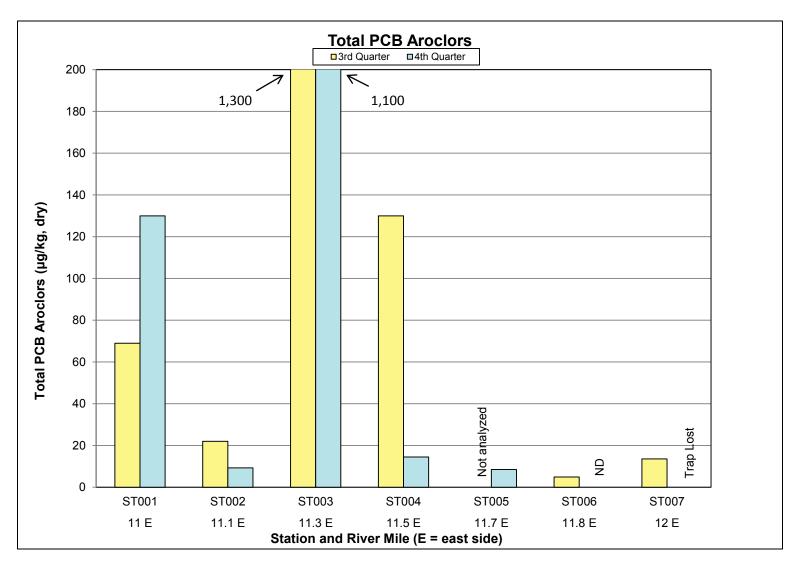


Figure 5.3-1b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCB Congener Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis. ND = not detected at quarter shown

Figure 5.3-2a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCB Aroclor Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters. ND = not detected at quarter shown

Figure 5.3-2b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCB Aroclor Concentrations
for In-River Sediment Traps, 2009

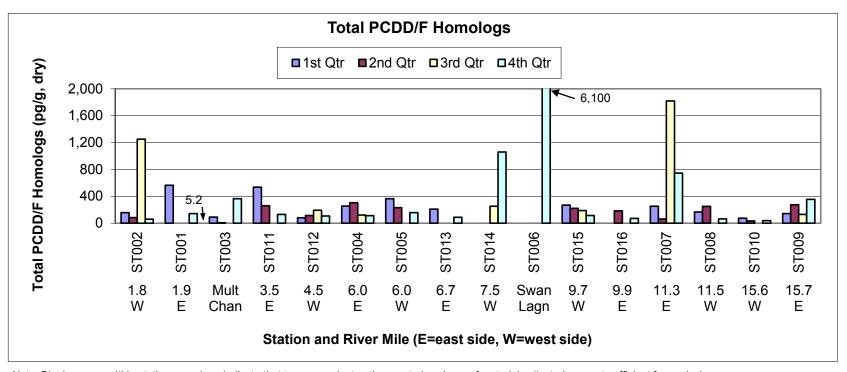


Figure 5.3-3a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCDD/F Homolog Concentrations
for In-River Sediment Traps, 2007

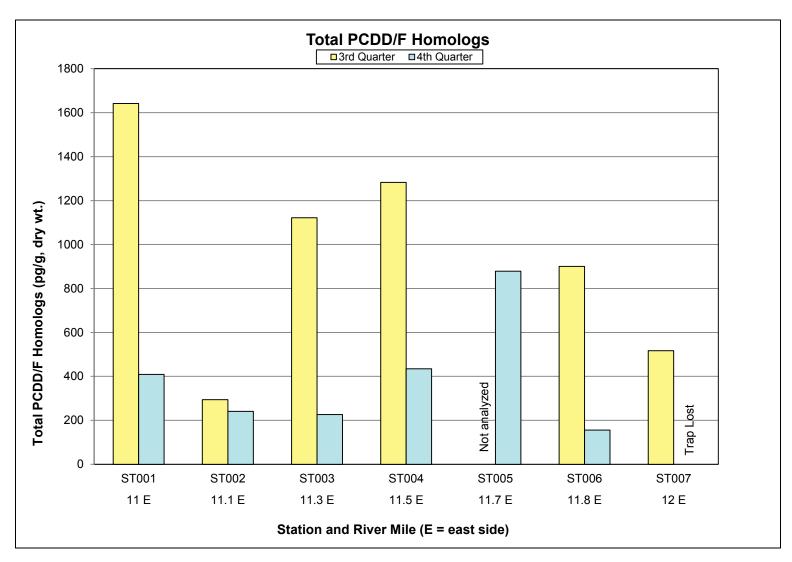


Figure 5.3-3b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PCDD/F Homolog Concentrations
for In-River Sediment Traps, 2009

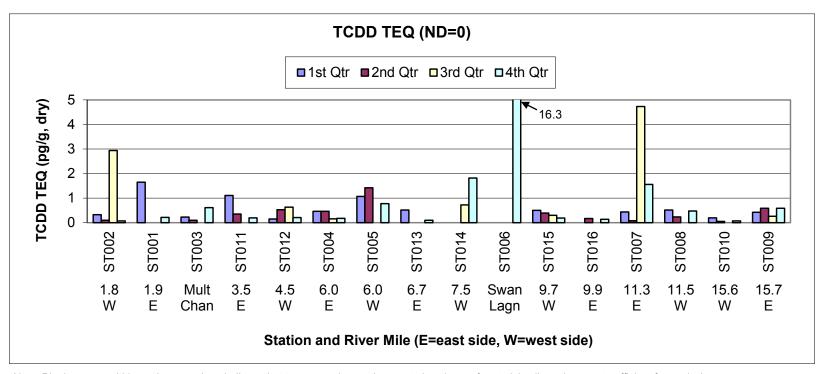


Figure 5.3-4a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total TCDD TEQ (ND=0) Concentrations
for In-River Sediment Traps, 2007

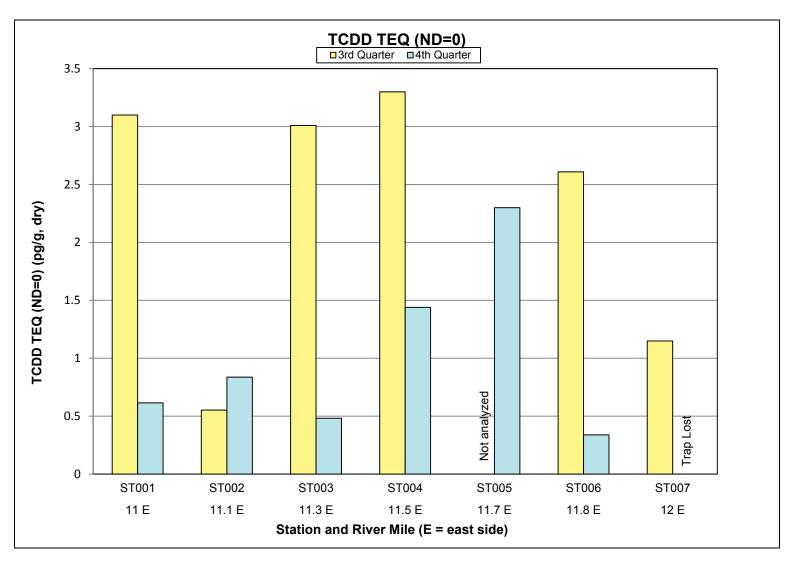


Figure 5.3-4b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total TCDD TEQ (ND=0) Concentrations
for In-River Sediment Traps, 2009

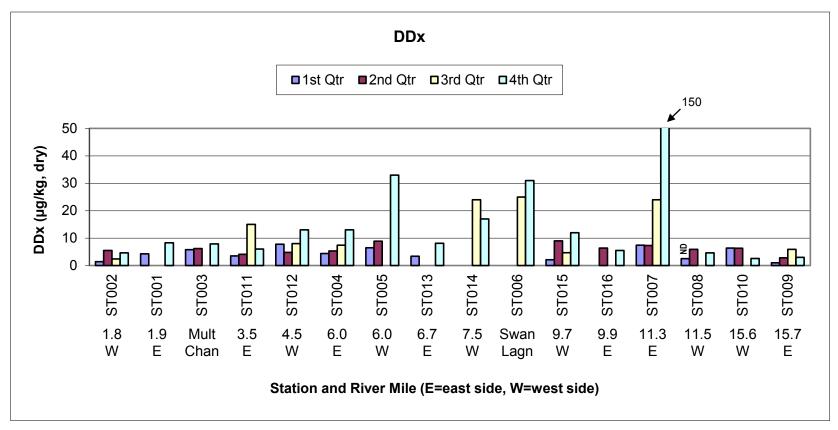
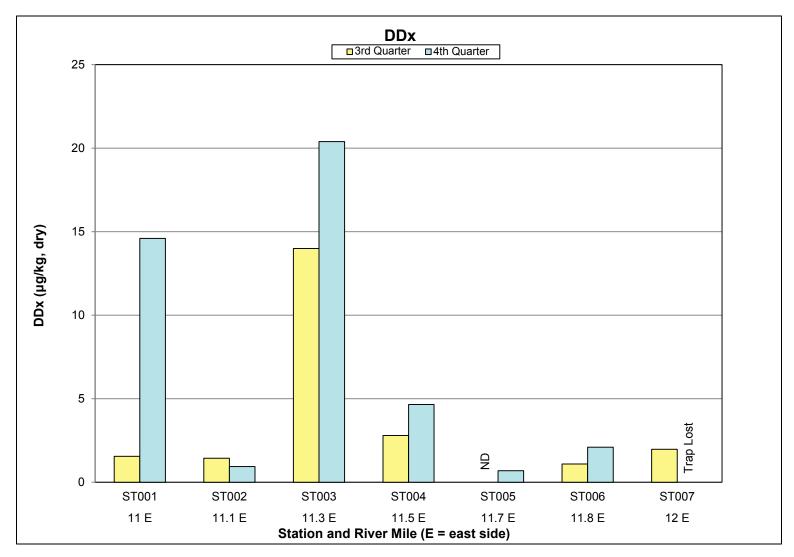


Figure 5.3-5a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of DDx Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters.

ND = not detected at quarter shown

Figure 5.3-5b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of DDx Concentrations
for In-River Sediment Traps, 2009

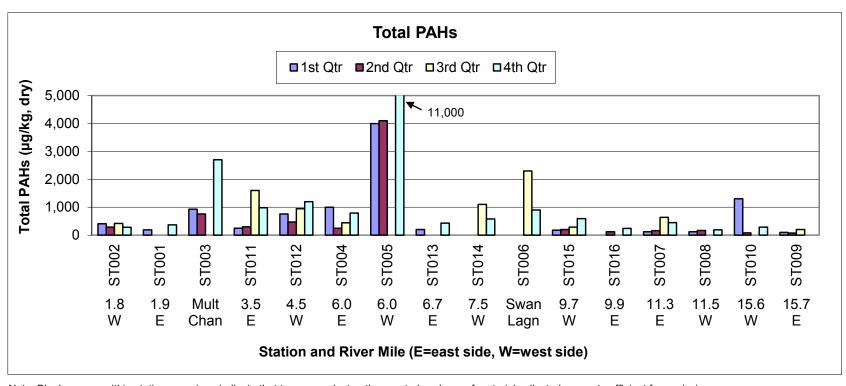


Figure 5.3-6a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PAH Concentrations
for In-River Sediment Traps, 2007

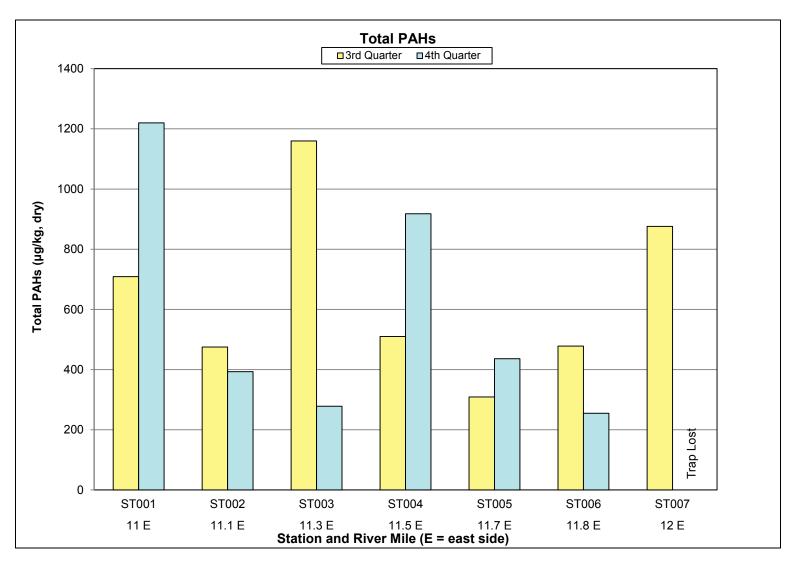
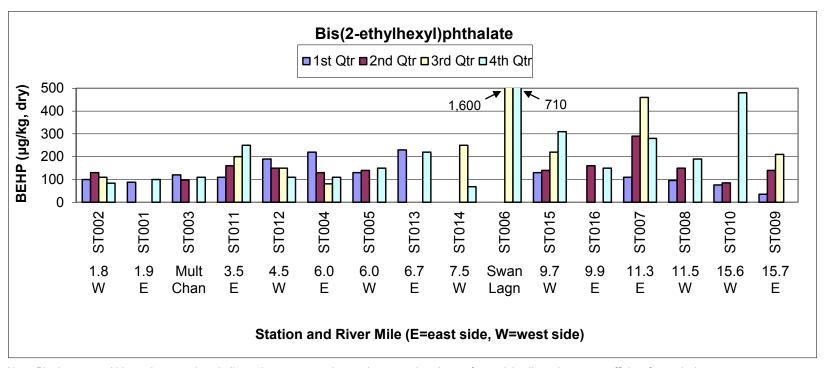


Figure 5.3-6b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total PAHs Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis.

Figure 5.3-7a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Bis(2-ethyhexyl)phthalate Concentrations
for In-River Sediment Traps, 2007

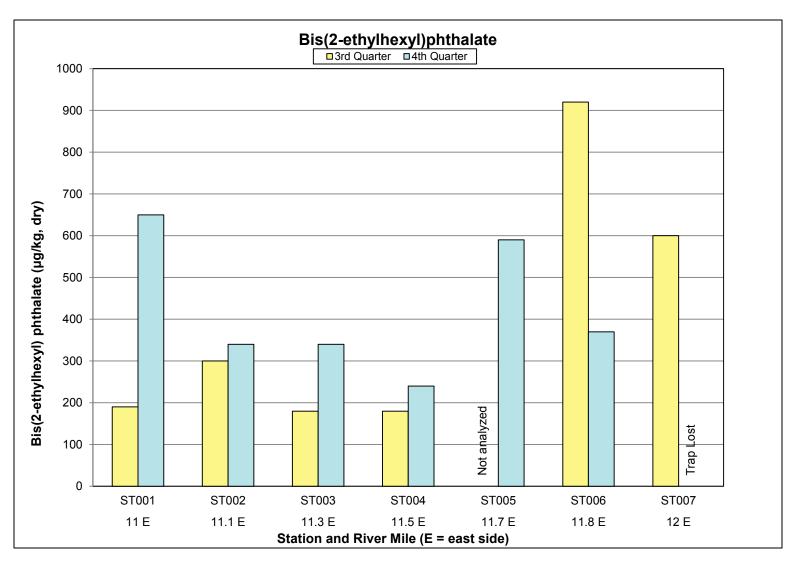
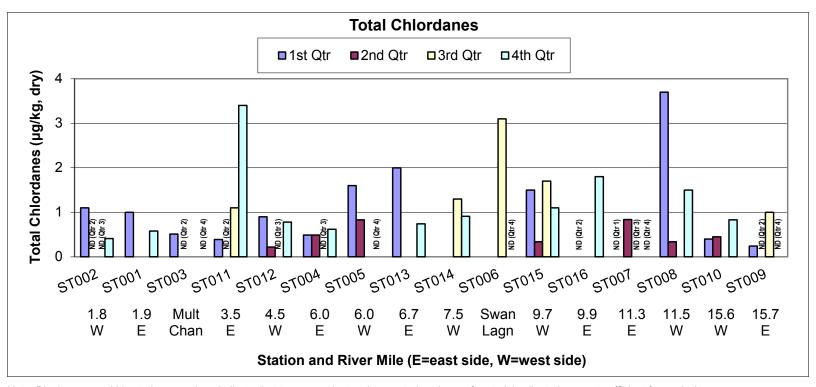
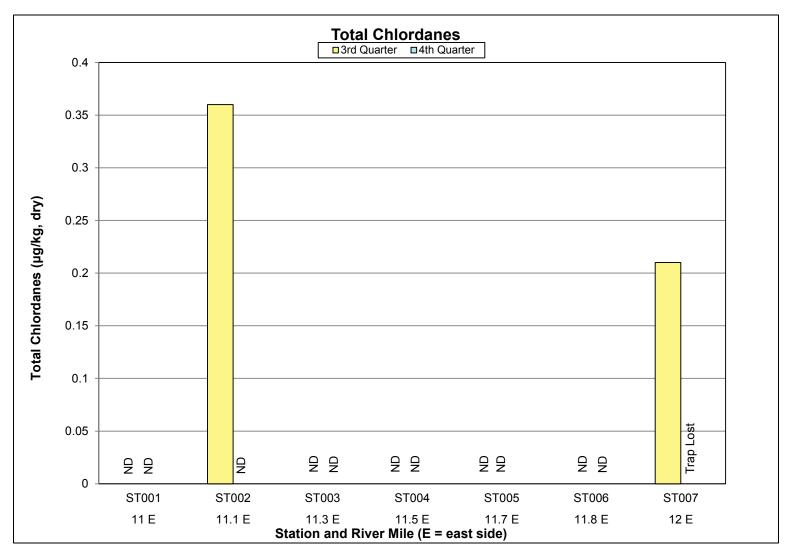


Figure 5.3-7b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Bis(2-ethyhexyl)phthalate Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis. ND = not detected at quarter shown

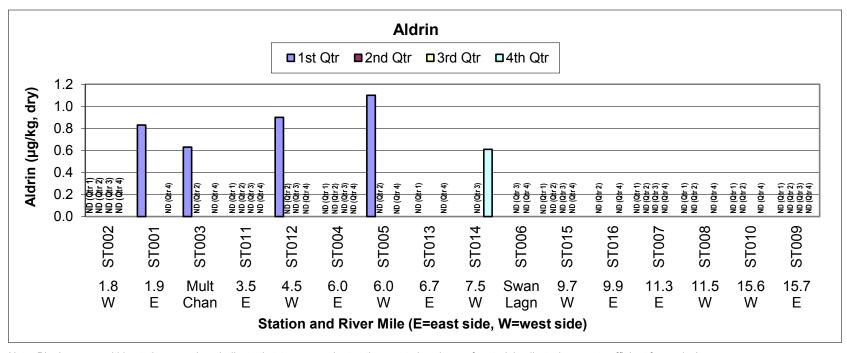
Figure 5.3-8a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total Chlordanes Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters.

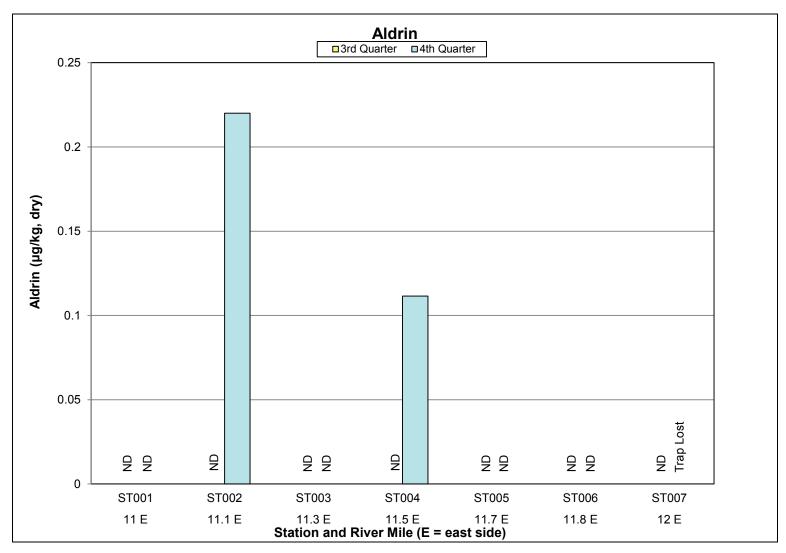
ND = not detected at quarter shown

Figure 5.3-8b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Total Chlordanes Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis. ND = not detected at quarter shown

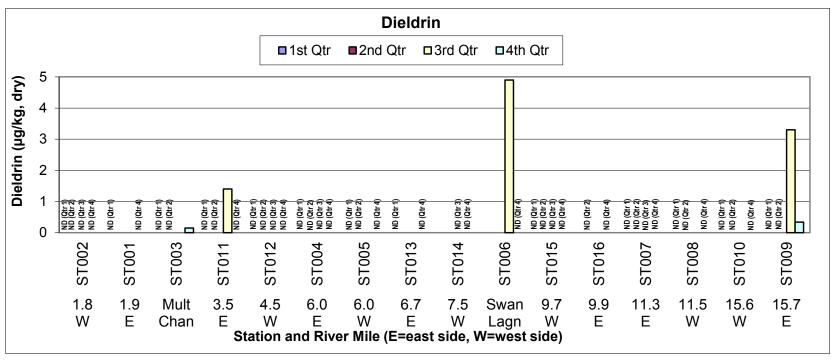
Figure 5.3-9a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Aldrin Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters.

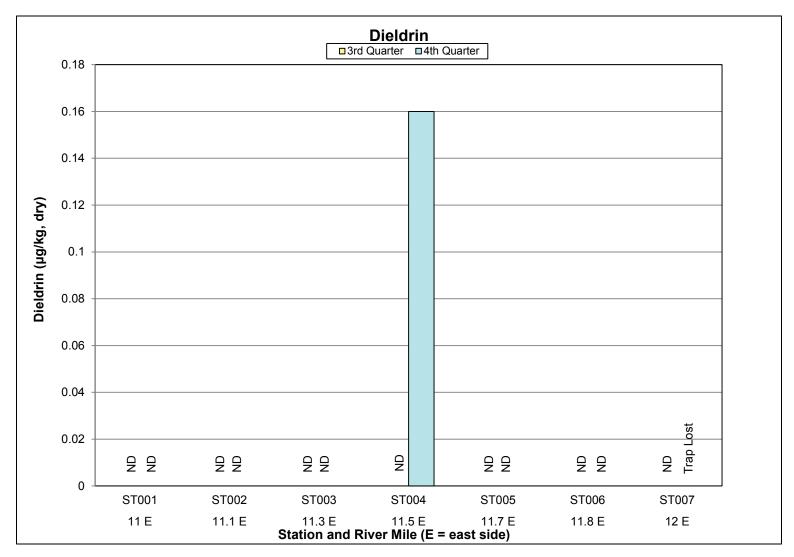
ND = not detected at quarter shown

Figure 5.3-9b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Aldrin Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis. ND = not detected at quarter shown

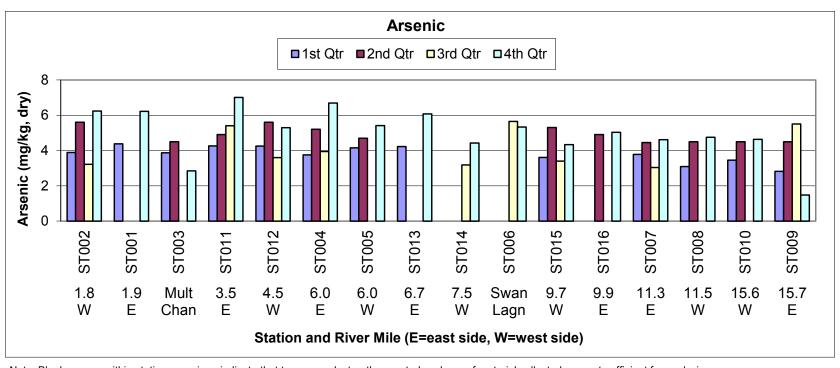
Figure 5.3-10a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Dieldrin Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters.

ND = not detected at quarter shown

Figure 5.3-10b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Dieldrin Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis.

Figure 5.3-11a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Arsenic Concentrations
for In-River Sediment Traps, 2007

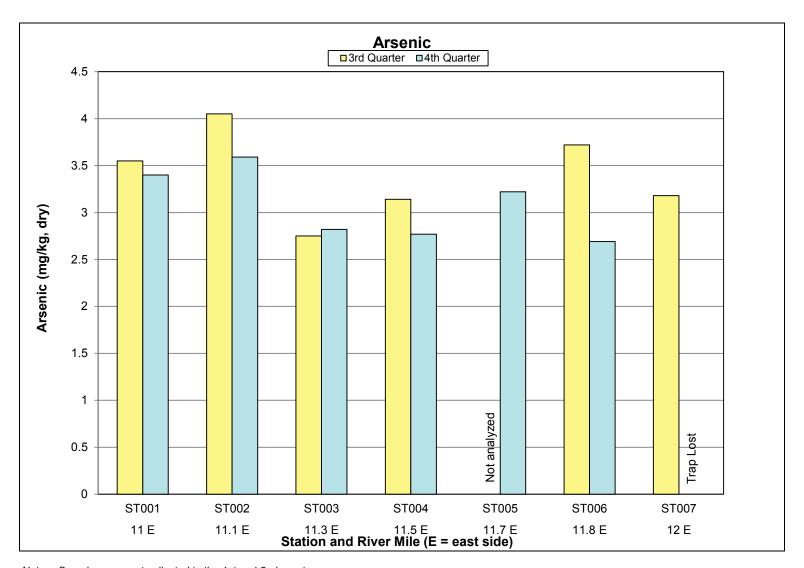
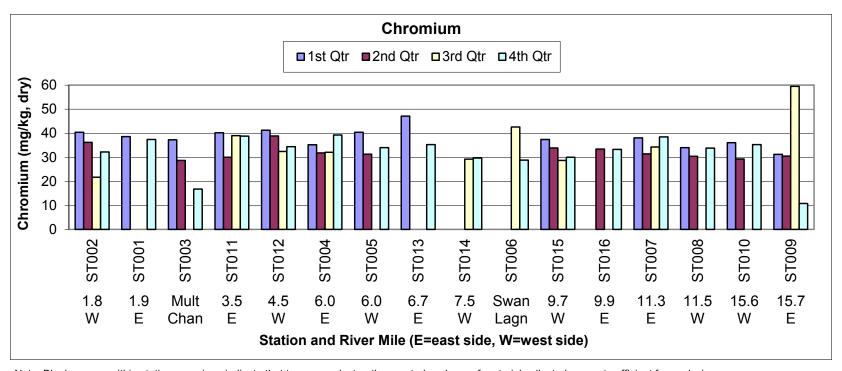


Figure 5.3-11b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Arsenic Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis.

Figure 5.3-12a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Chromium Concentrations
for In-River Sediment Traps, 2007

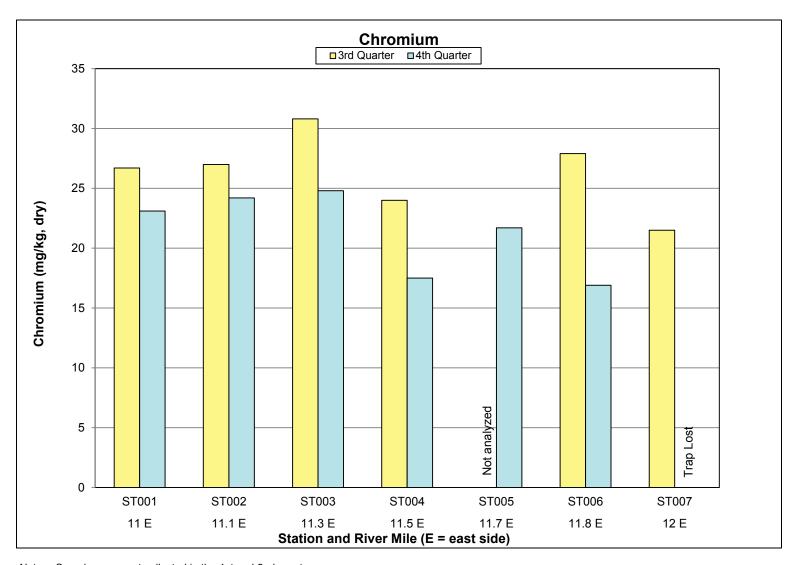
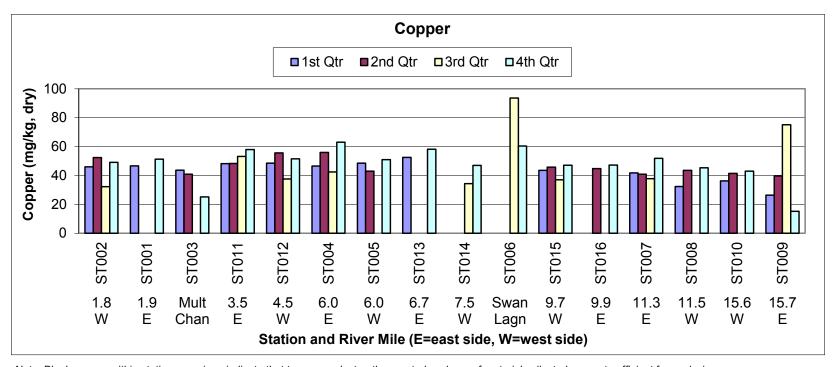


Figure 5.3-12b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Chromium Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis.

Figure 5.3-13a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Copper Concentrations
for In-River Sediment Traps, 2007

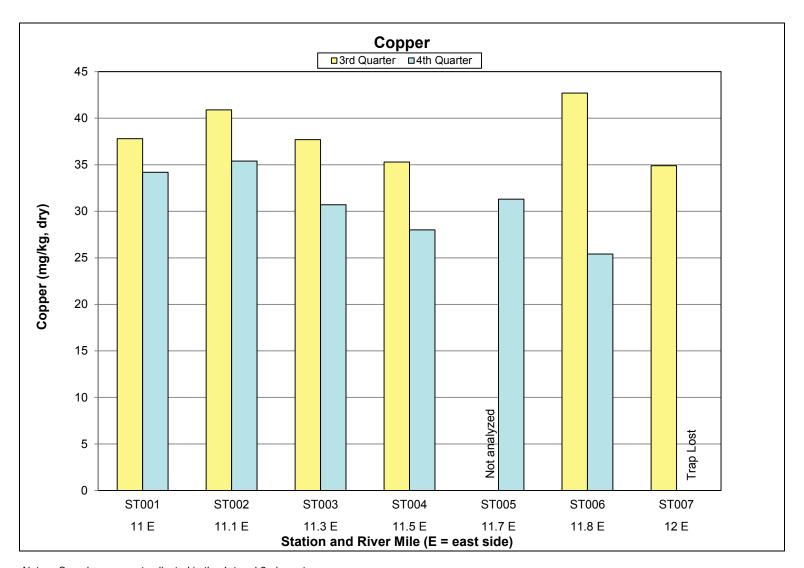
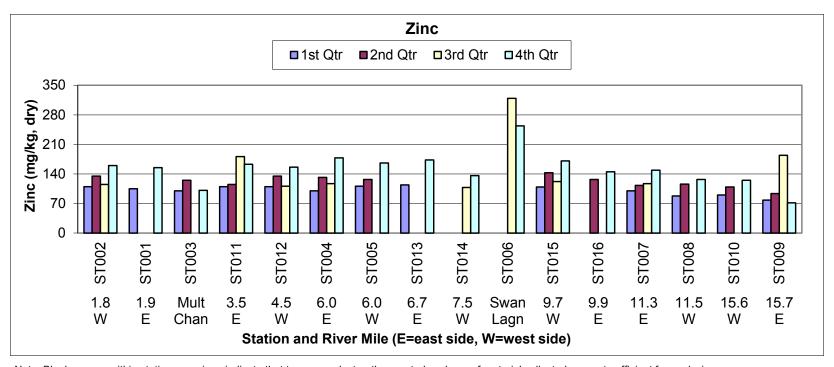


Figure 5.3-13b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Copper Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis.

Figure 5.3-14a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Zinc Concentrations
for In-River Sediment Traps, 2007

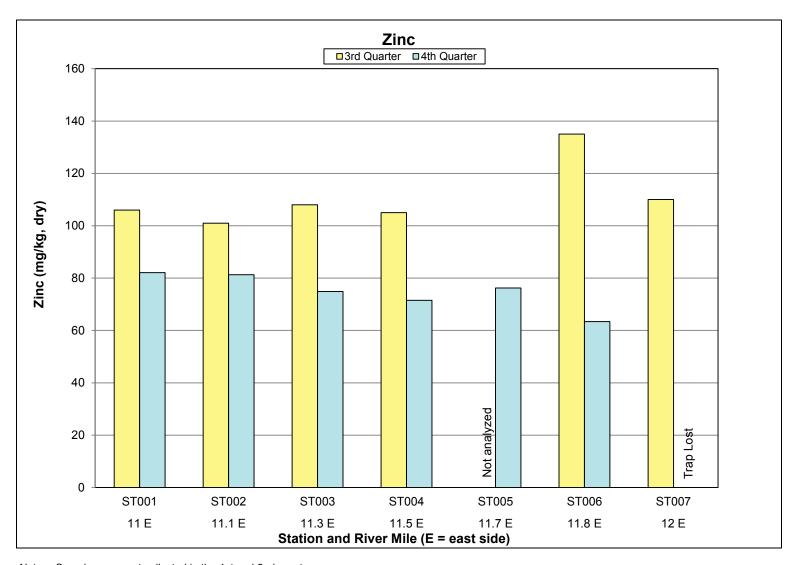
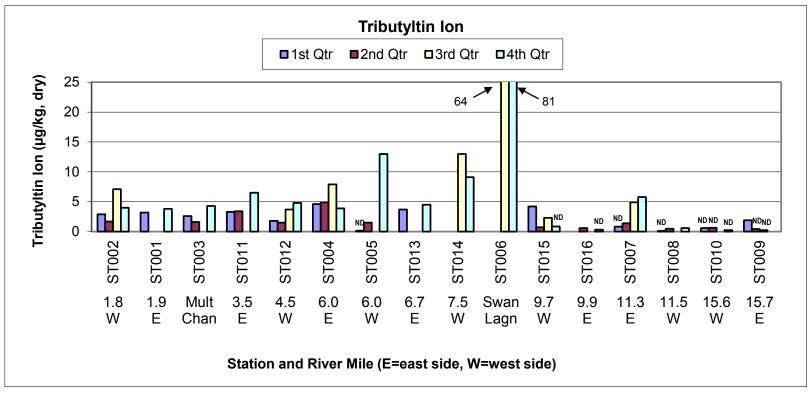
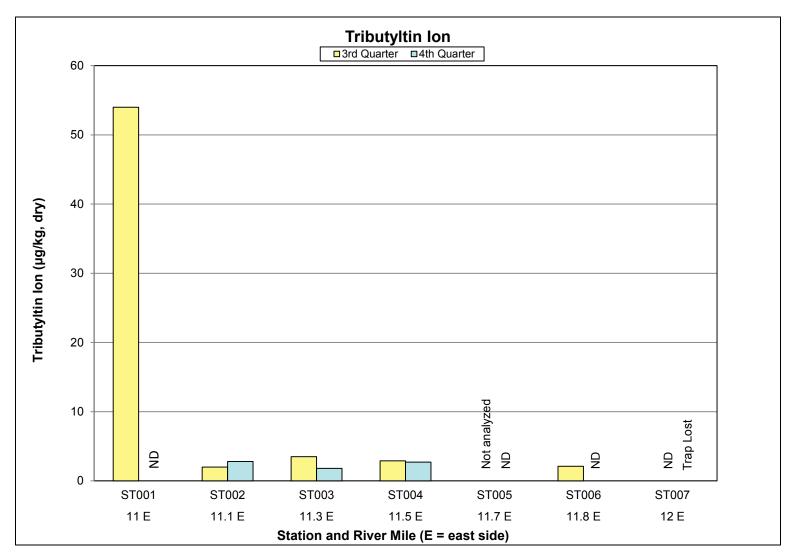


Figure 5.3-14b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Zinc Concentrations
for In-River Sediment Traps, 2009



Note: Blank spaces within station groupings indicate that traps were lost or the quarterly volume of material collected was not sufficient for analysis. ND = not detected at value shown

Figure 5.3-15a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Tributyltin Ion Concentrations
for In-River Sediment Traps, 2007



Note: Samples were not collected in the 1st and 2nd quarters.

ND = not detected at quarter shown

Figure 5.3-15b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Tributyltin Ion Concentrations
for In-River Sediment Traps, 2009

Accumulation Rate of Trapped Sediments as a Function of Fines

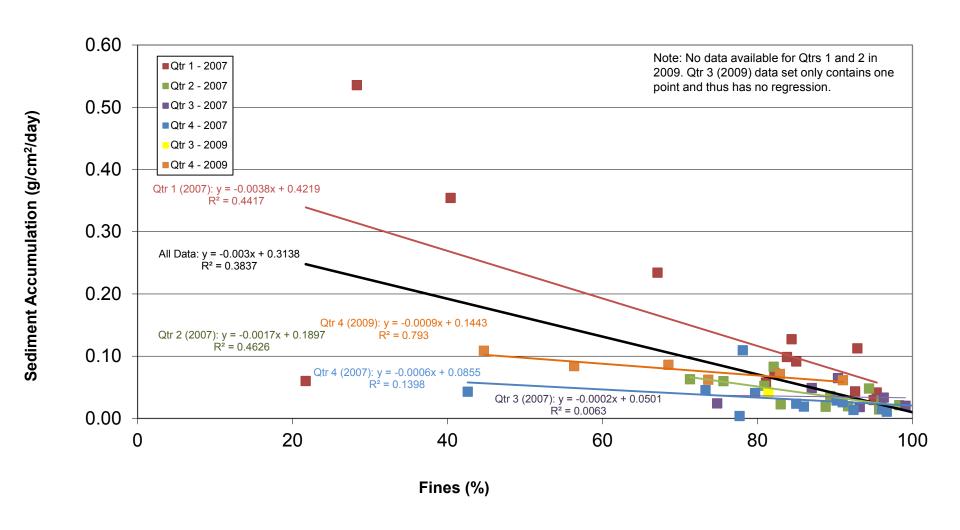


Figure 5.3-16
Portland Harbor RI/FS
Remedial Investigation Report
Regression of Sediment Accumulation Rate of Trapped
Sediment for In-River Sediment Trap Sampling

Sediment Trap PCB Congers as a Function of Aroclors

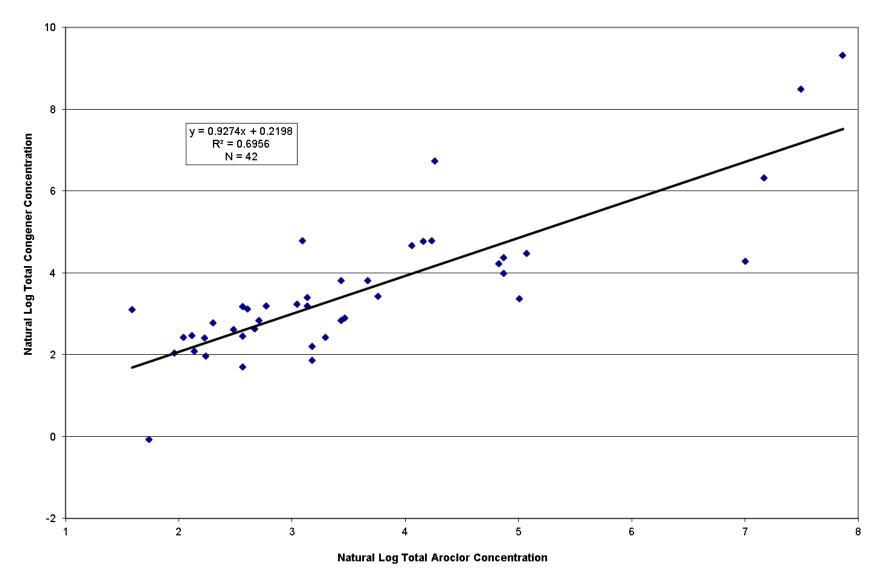


Figure 5.3-17
Portland Harbor RI/FS
Remedial Investigation Report
Regression of Total PCB Congener and PCB Aroclor
Concentrations for In-River Sediment Traps

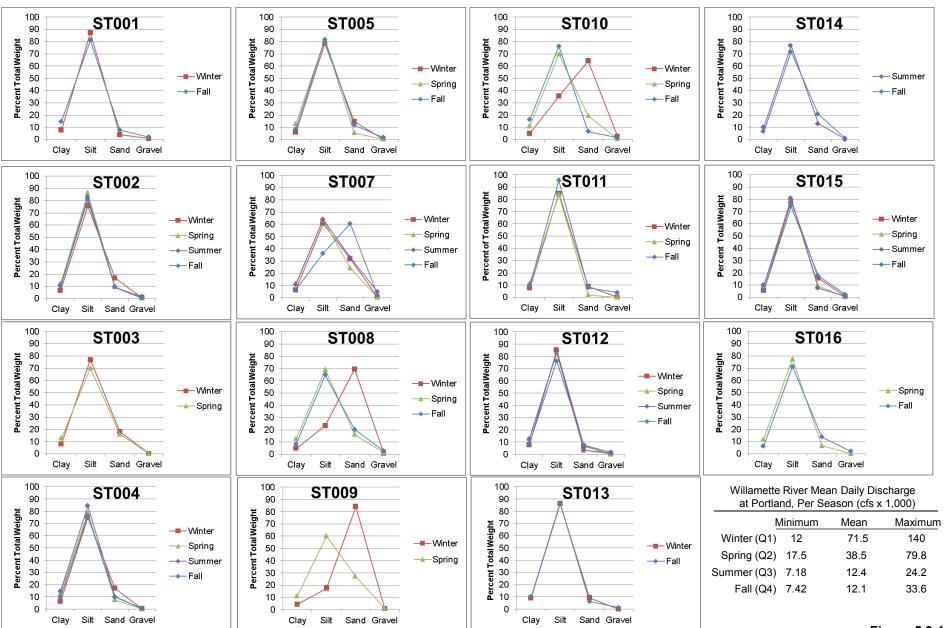
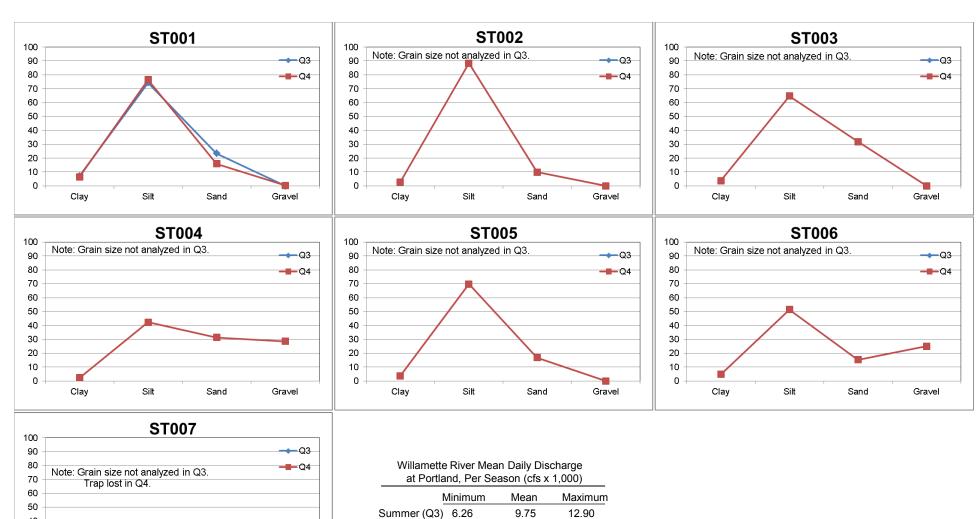


Figure 5.3-18a
Portland Harbor RI/FS
Remedial Investigation Report
Grain Size Distribution of Sediment Trap
Samples by Quarter, 2007



Fall (Q4) 8.60

40

Clay

Silt

Sand

Gravel

12.90

96.70

33.48

Figure 5.3-18b Portland Harbor RI/FS Remedial Investigation Report Grain Size Distribution of Sediment Trap Samples by Quarter, 2009

Sediment Trap Sampling Events with Hydrographs (Daily and Average) October 1, 2006- December 31, 2007

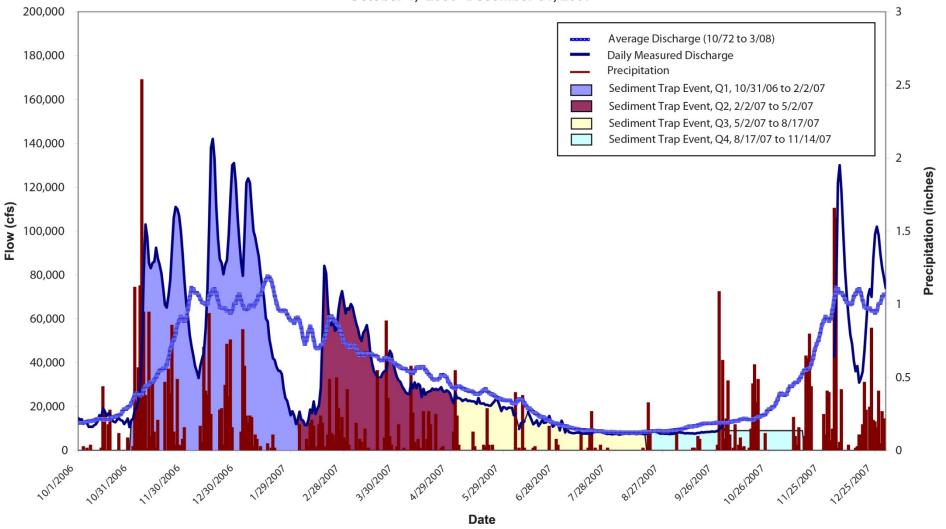


Figure 5.3-19a
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of the Willamette River at Portland
During In-River Sediment Trap Sampling

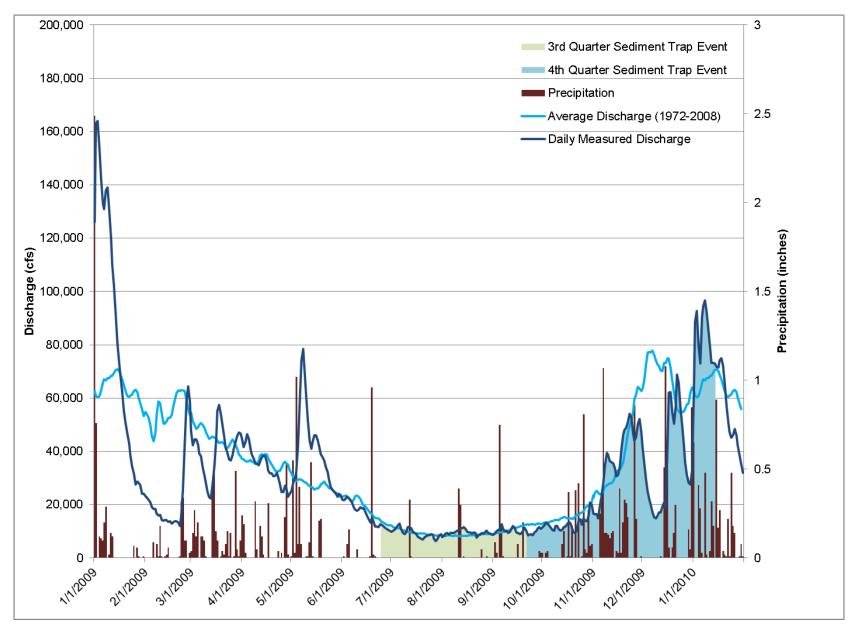
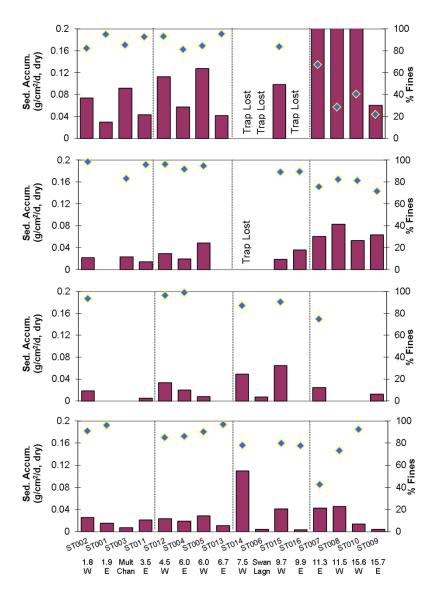
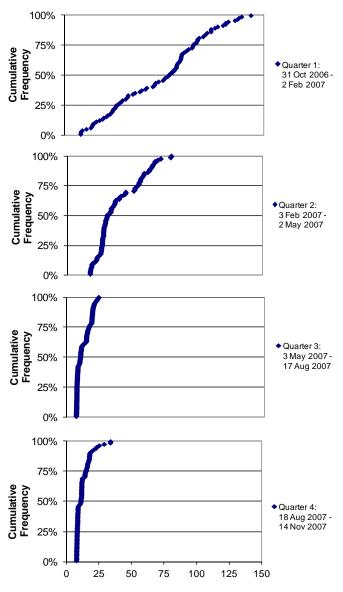


Figure 5.3-19b
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of the Willamette River at Portland
During In-River Sediment Trap Sampling

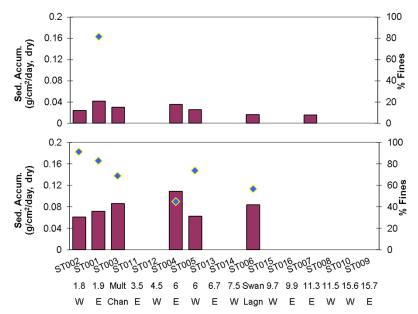


Station and River Mile (E=east side, W=west side) Sediment accumulation rates represented by bars; percent fines represented by diamonds.



Mean Daily Discharge of Willamette R. at Portland (cfs x 1,000)

Figure 5.3-20a Portland Harbor RI/FS Remedial Investigation Report Histograms of Sediment Accumulation Rates by Quarter and Corresponding Frequency Distribution of Willamette River Discharge, 2007



Station and River Mile (E=east side, W=west side).
Sediment accumulation rates represented by bars; percent fines represented by diamonds.

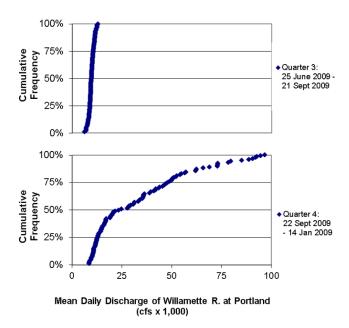
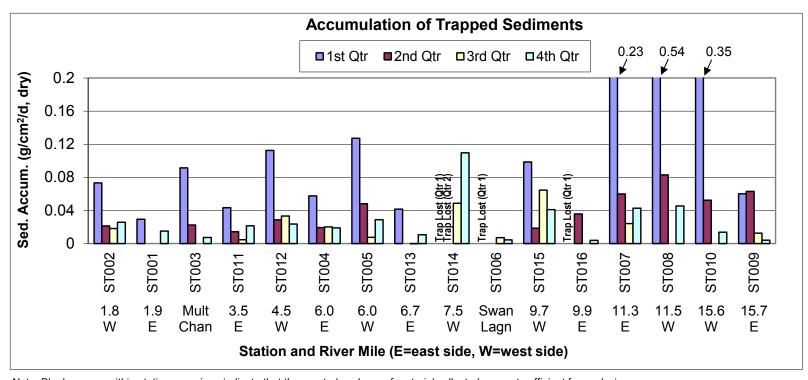


Figure 5.3-20b
Portland Harbor RI/FS
Remedial Investigation Report
Histograms of Sediment Accumulation Rates by Quarter and
Corresponding Frequency Distribution of
Willamette River Discharge, 2009



Note: Blank spaces within station groupings indicate that the quarterly volume of material collected was not sufficient for analysis.

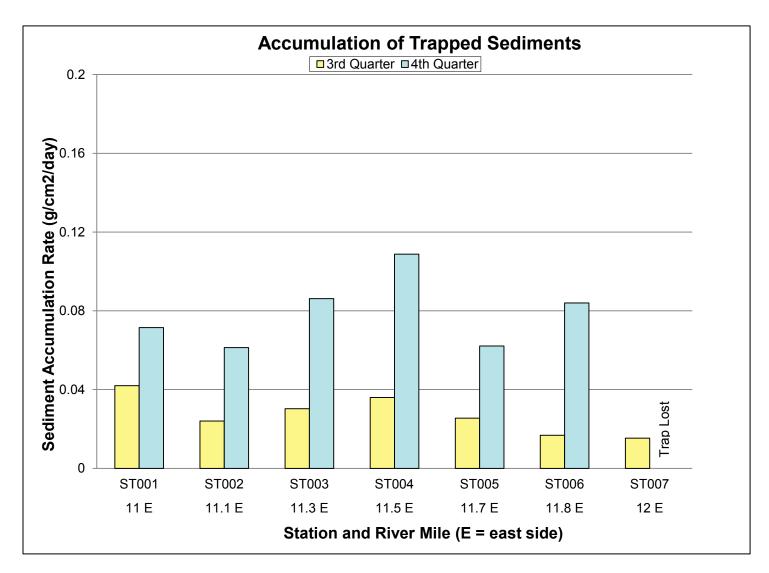


Figure 5.3-21b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram of Accumulation Rate of Trapped Sediment
for In-River Sediment Trap Sampling, 2009

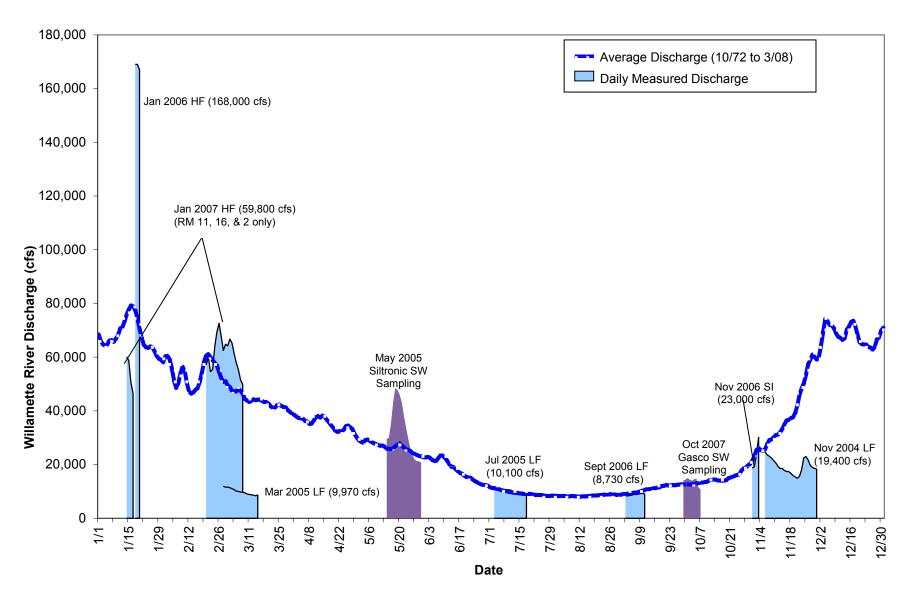


Figure 5.4-1
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Willamette River Comparing Average Daily Discharge
for Period of Record (1972-2008) and Average Daily Discharge
During Individual Surface Water Sampling Events by Day of Year

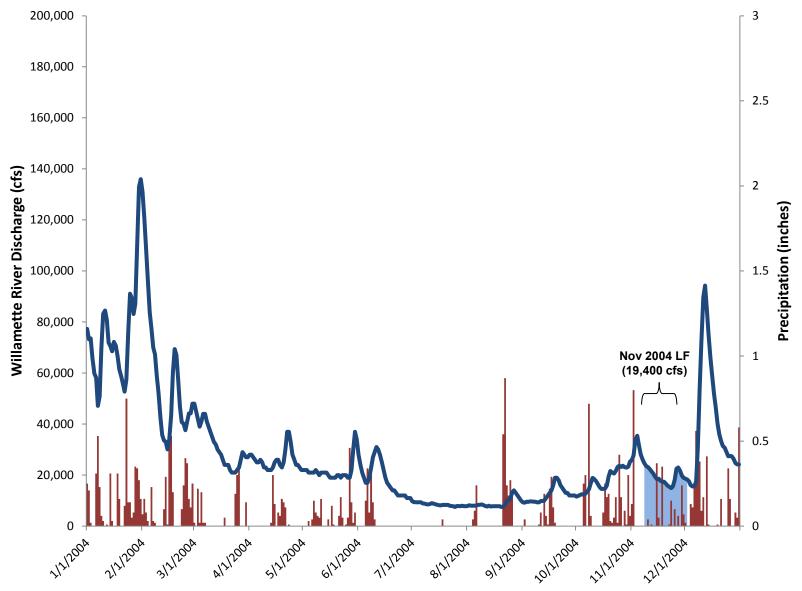


Figure 5.4-2a
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Average Daily Discharge for Willamette River (1972-2008)
and Daily Discharge during Surface Water Sampling Events by Day of
Year with Hyetograph of Precipitation Events (2004)

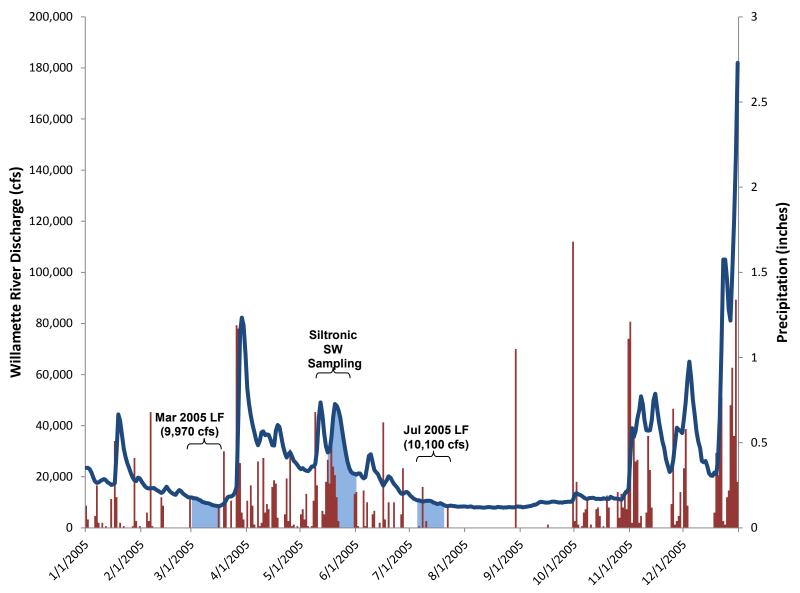


Figure 5.4-2b
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Average Daily Discharge for Willamette River (1972-2008)
and Daily Discharge during Surface Water Sampling Events by Day of
Year with Hyetograph of Precipitation Events (2005)

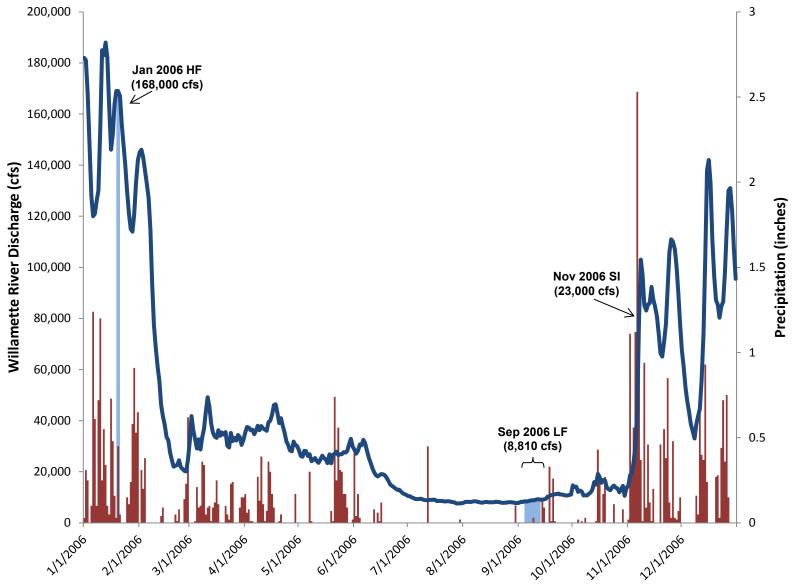


Figure 5.4-2c
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Average Daily Discharge for Willamette River (1972-2008)
and Daily Discharge during Surface Water Sampling Events by Day of
Year with Hyetograph of Precipitation Events (2006)

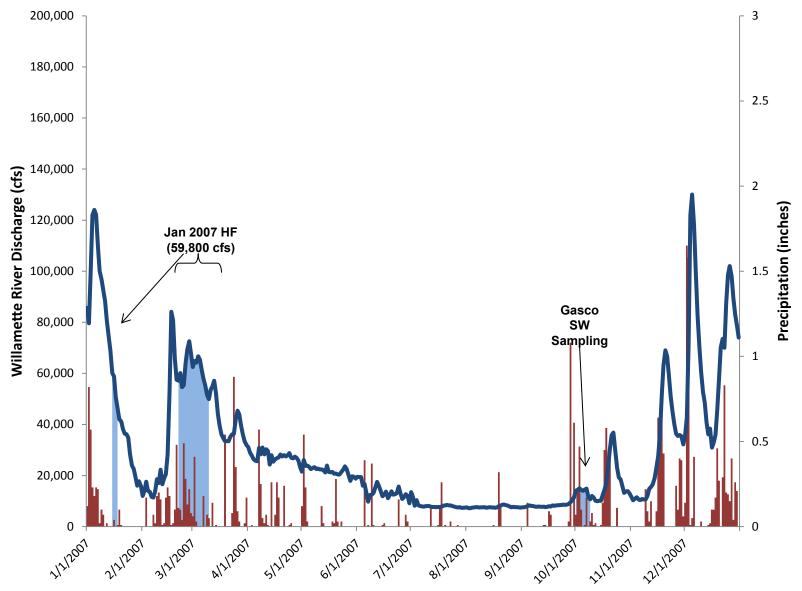
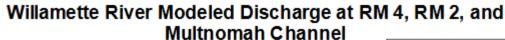
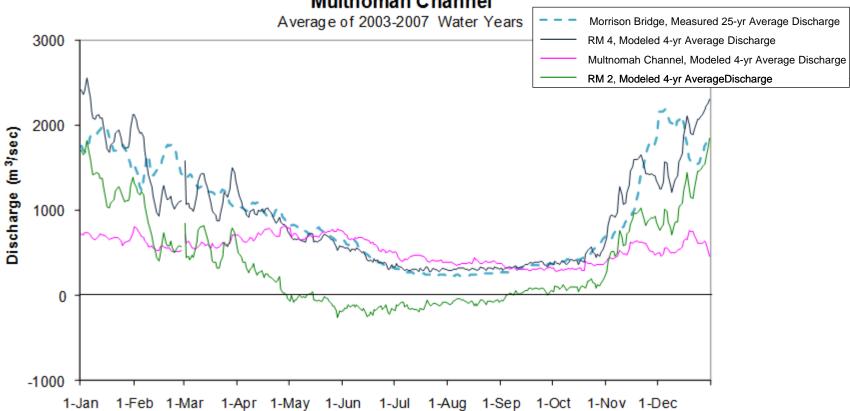


Figure 5.4-2d
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Average Daily Discharge for Willamette River (1972-2008)
and Daily Discharge during Surface Water Sampling Events by Day of
Year with Hyetograph of Precipitation Events (2007)



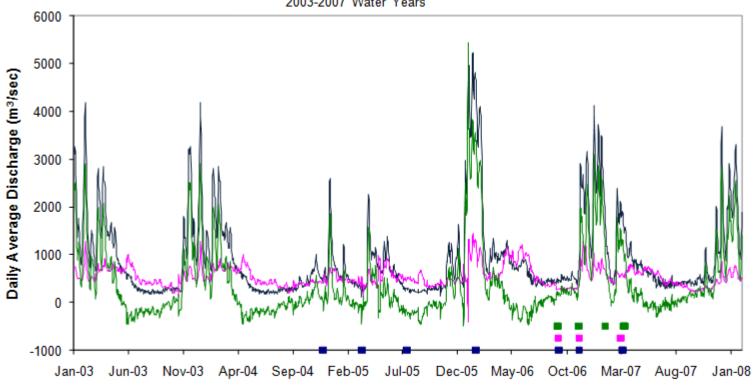


Note: Discharge values below 0 m3/sec indicate flow direction reversal from downstream to upstream.

Figure 5.4-3
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Willamette River Comparing Measured Average Daily
Discharge with Modeled Average Daily Discharge at RM 4, RM 2, and
Multnomah Channel by Day of Year (2003–2007)

Willamette River Modeled Discharge at RM 4, RM 2, and Multnomah Channel

2003-2007 Water Years



Note: Discharge values below 0 m3/sec indicate flow direction reversal from downstream to upstream.

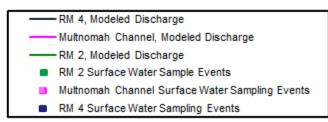


Figure 5.4-4
Portland Harbor RI/FS
Remedial Investigation Report
Hydrograph of Willamette River Presenting Modeled Daily Average
Discharge at RM 4, RM 2, and Multnomah Channel for Each Day
During Period 2003–2007

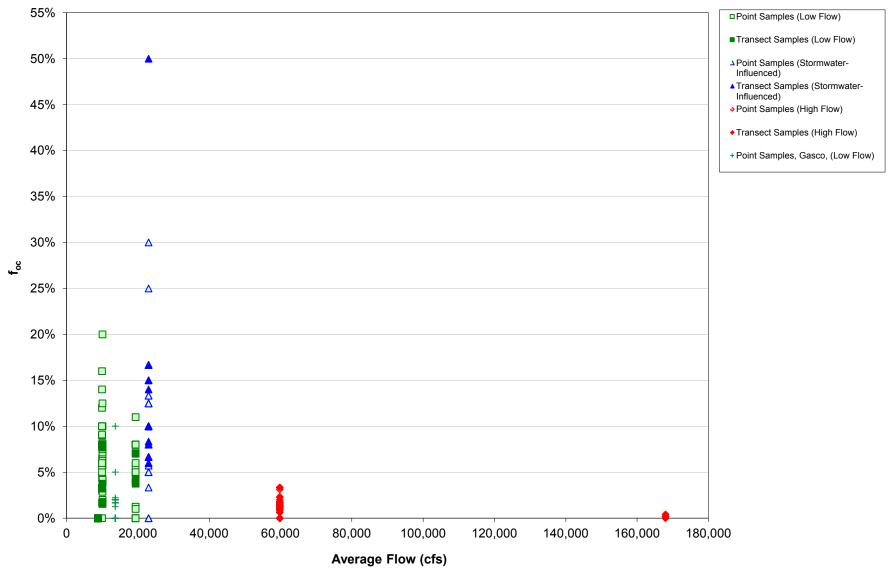


Figure 5.4-5
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Organic Carbon Content vs. Flow Rate in
Surface Water, RM 2-16 (Peristaltic)

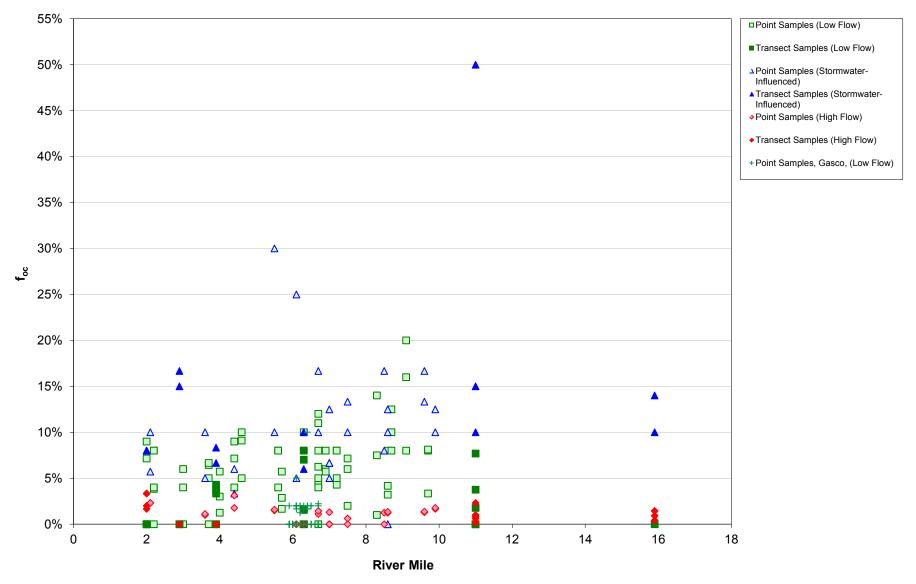


Figure 5.4-6
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Organic Carbon Content vs. River Mile in
Surface Water, RM 2-16 (Peristaltic)

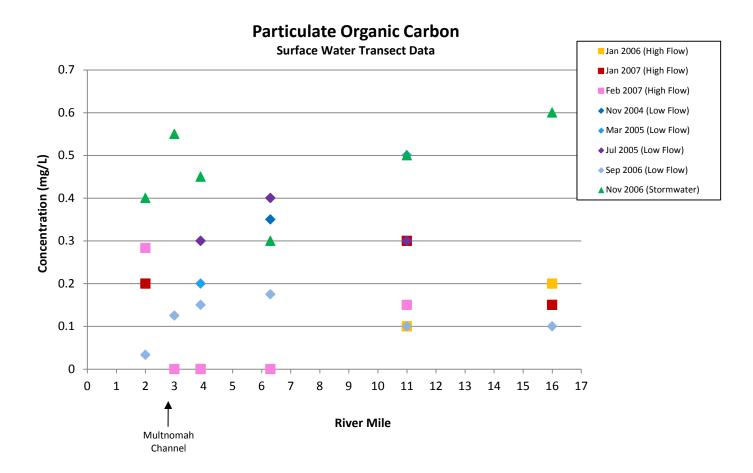


Figure 5.4-7
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Concentration at Surface Water Transect
Stations by Sample Event –Particulate Organic Carbon

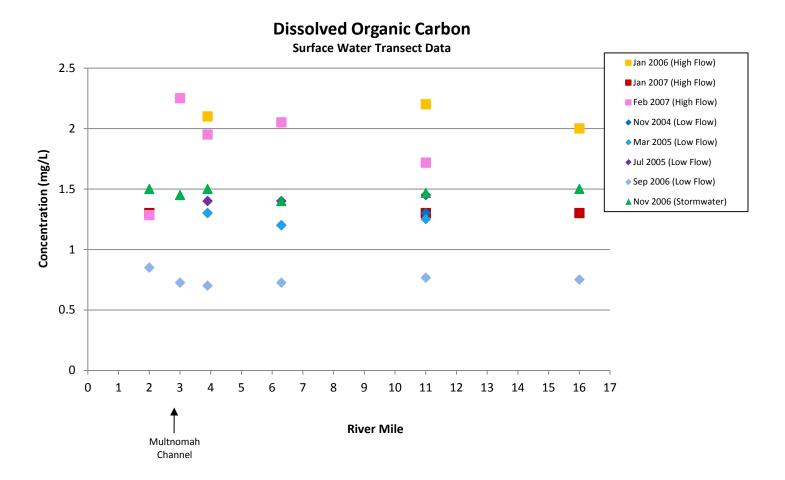


Figure 5.4-8
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Concentration at Surface Water Transect
Stations by Sample Event –Dissolved Organic Carbon

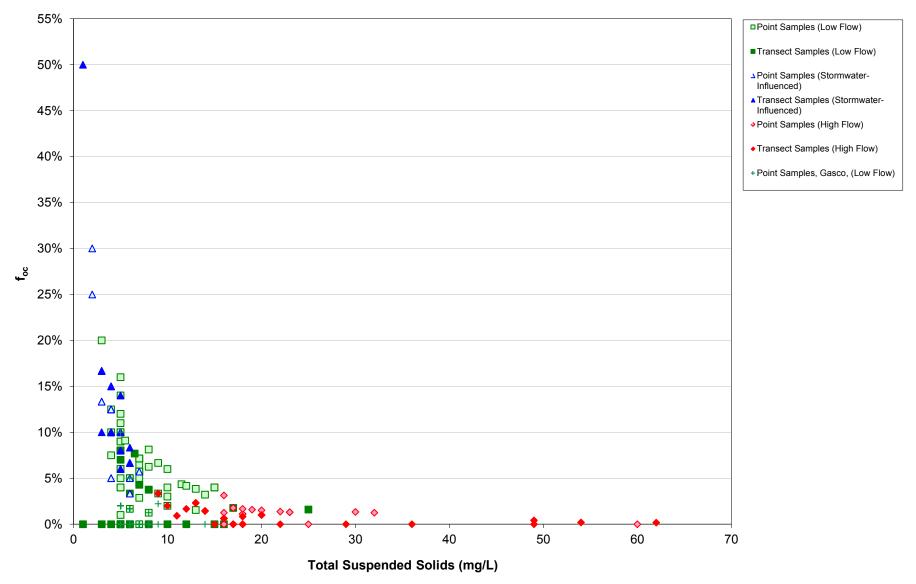
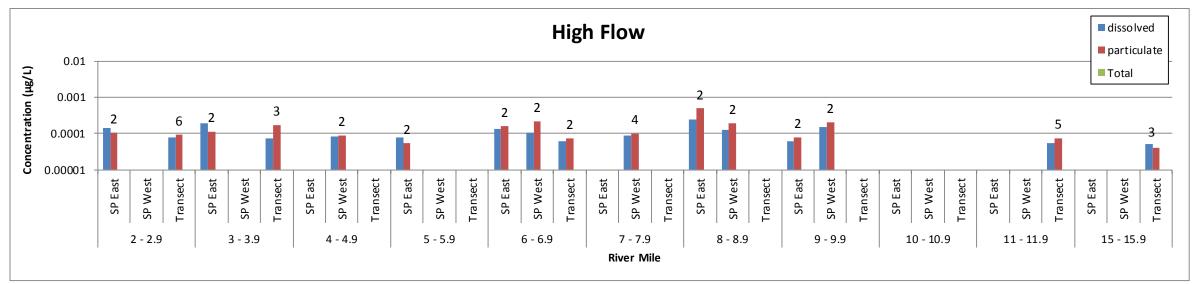
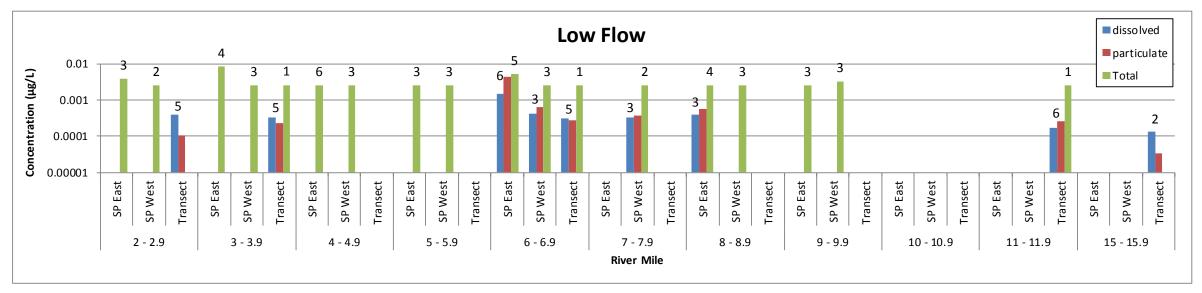
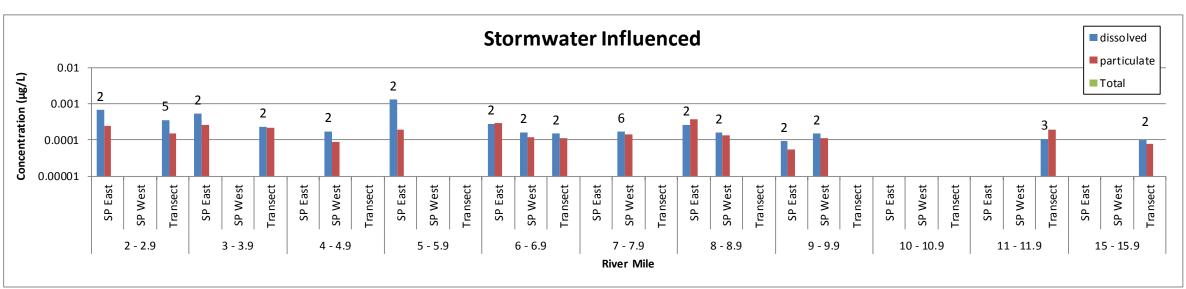


Figure 5.4-9
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Organic Carbon Content vs. Total Suspended Solids
Concentrations in Surface Water, RM 2-16 (Peristaltic)







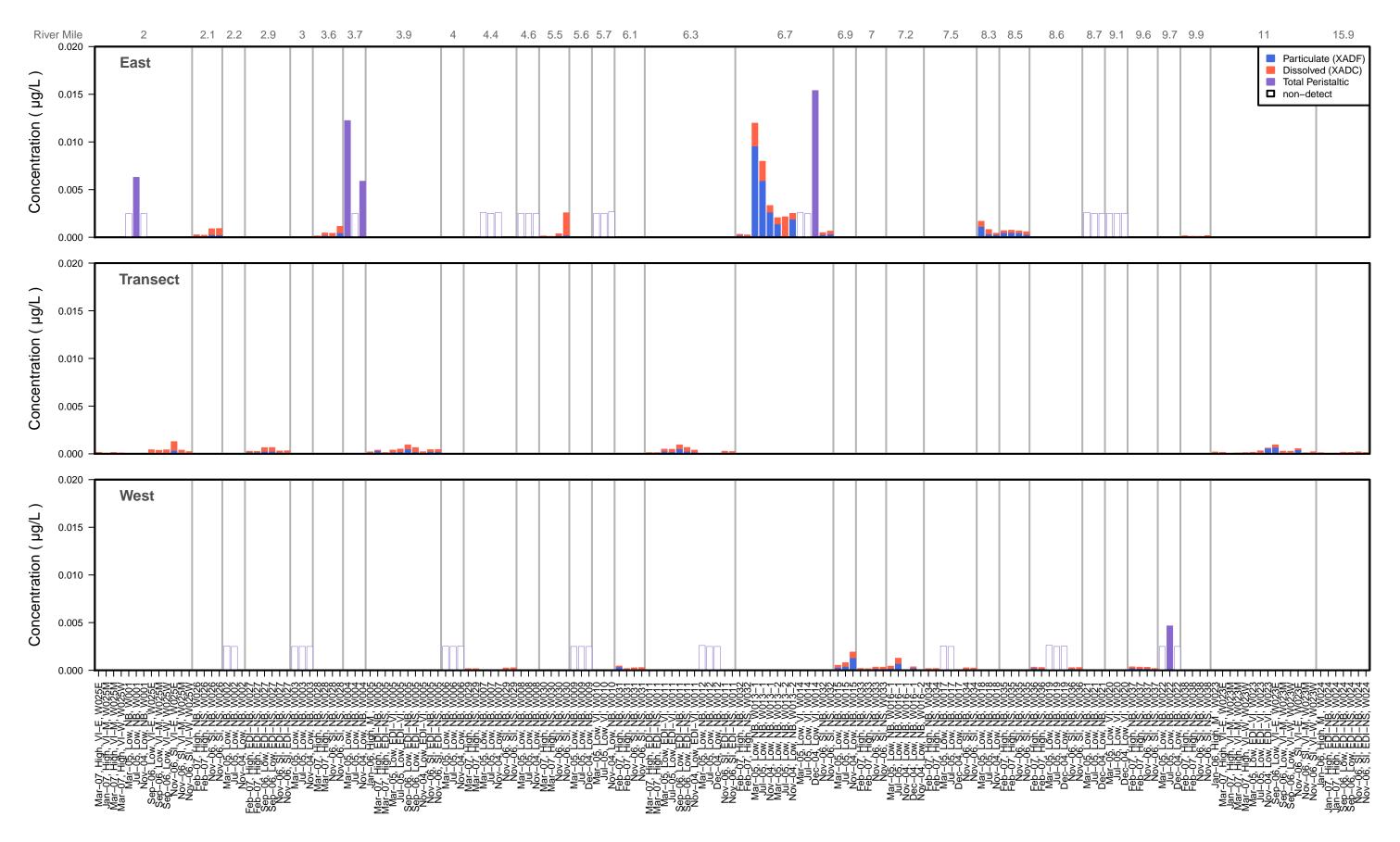


Figure 5.4–11a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total PCBs Concentrations in Surface Water, RM 2–16

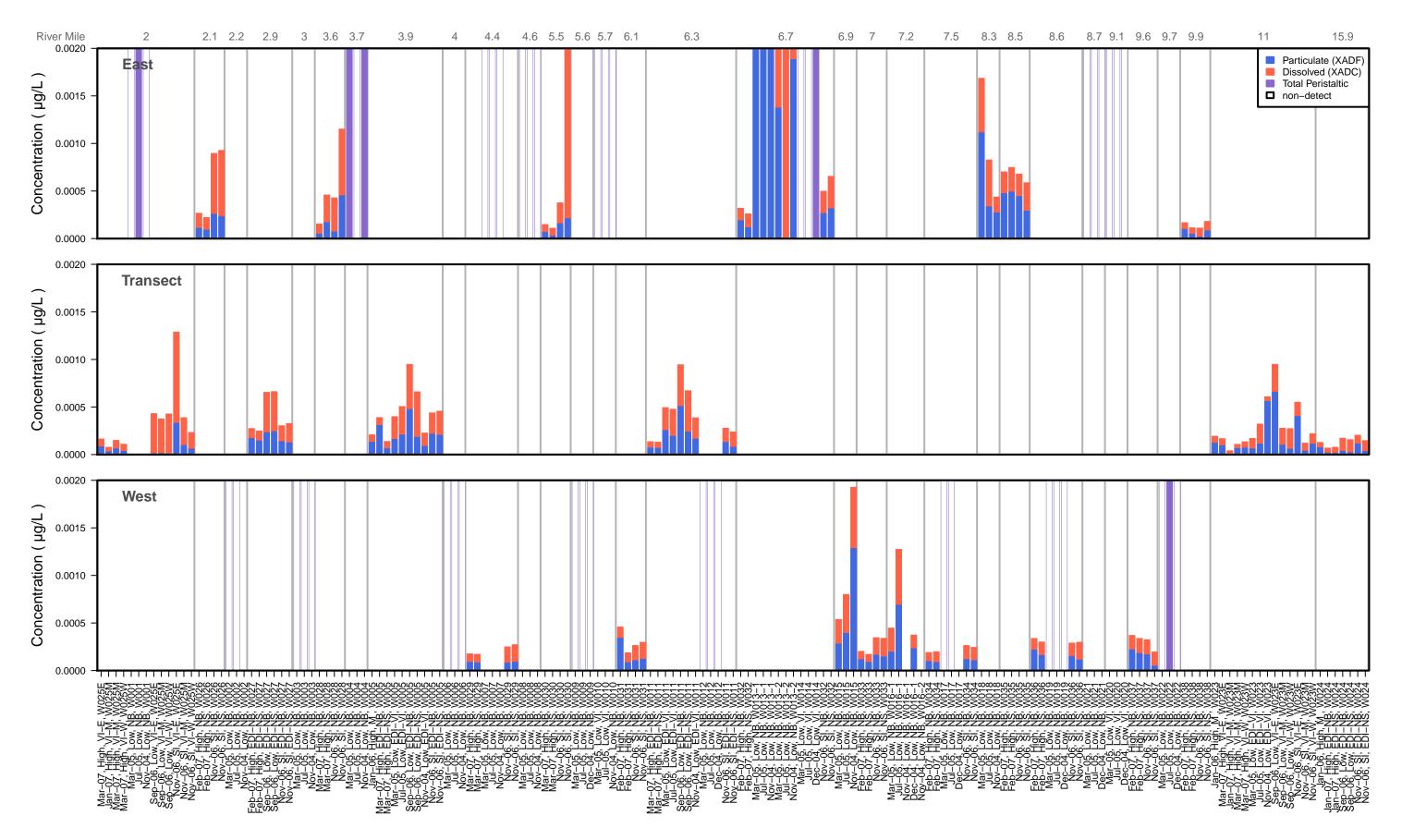


Figure 5.4–11b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total PCBs Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

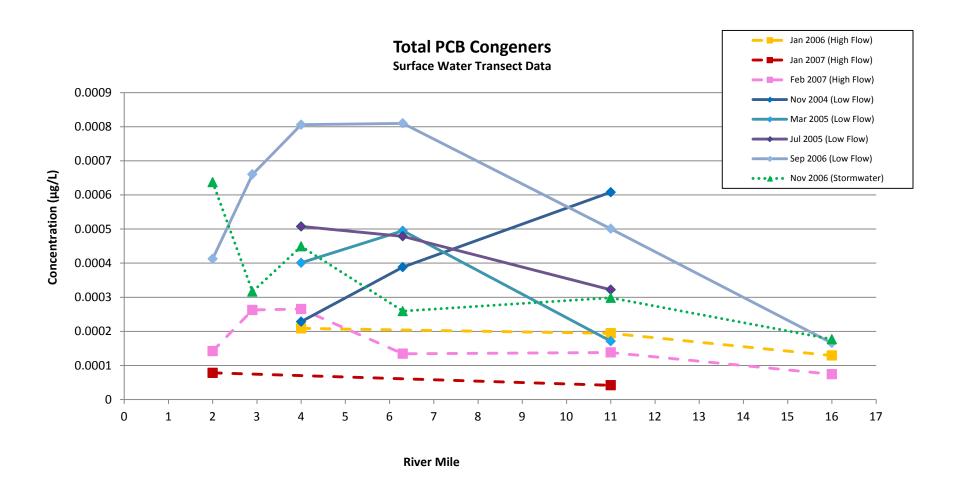


Figure 5.4-12
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Total PCBs Concentrations in
Surface Water by River Mile (RM 2–16)

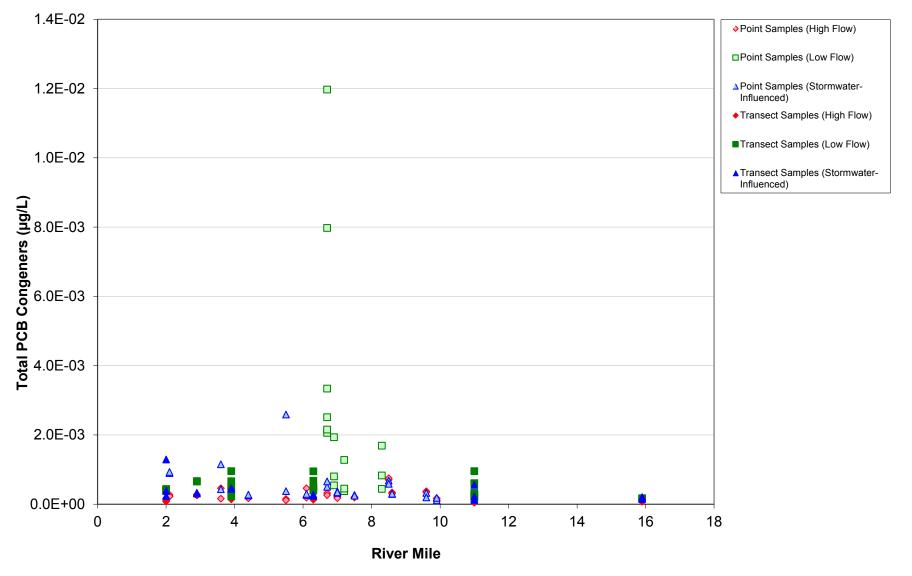


Figure 5.4-13a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Total PCBs Concentrations in
Surface Water by River Mile (RM 2-16)

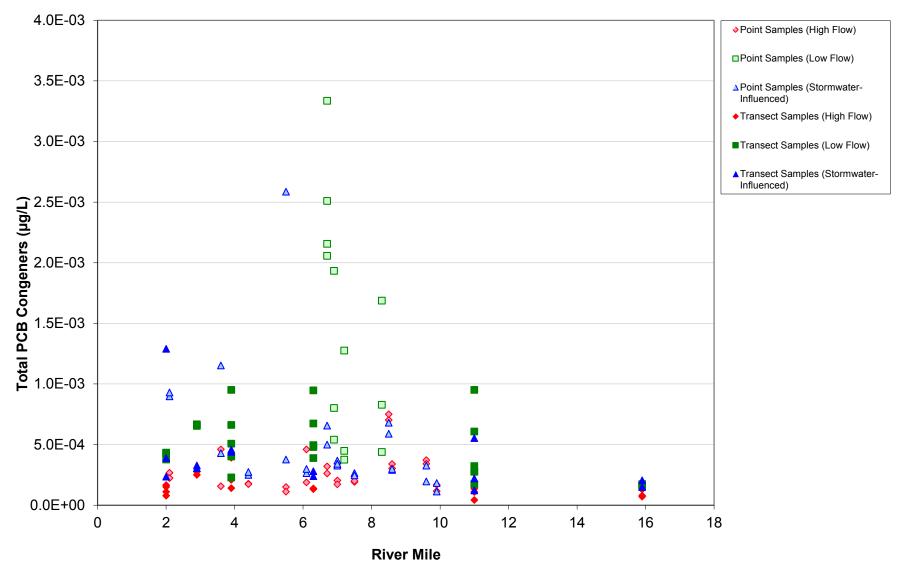
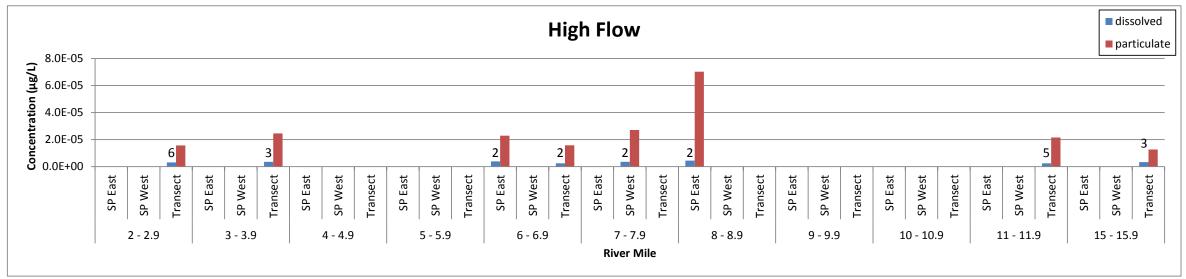
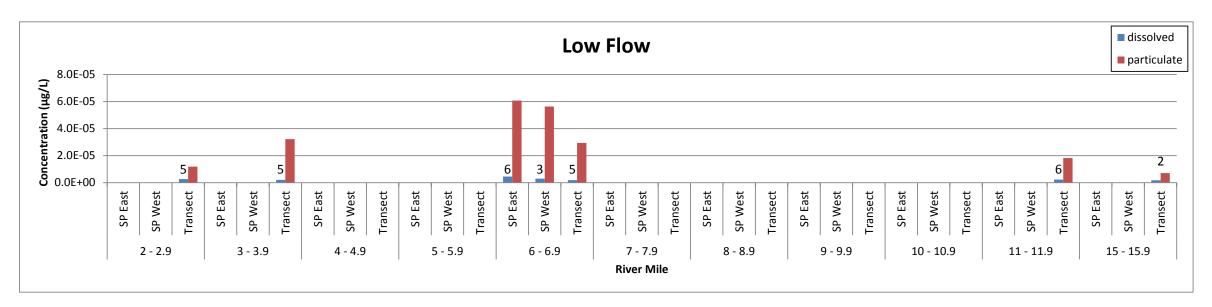
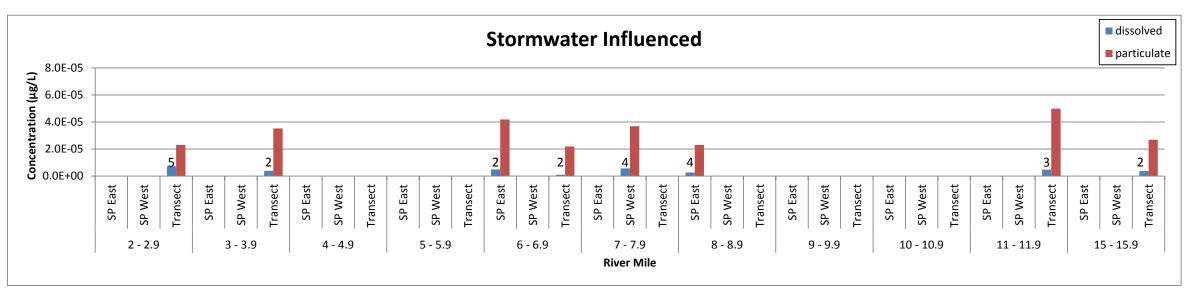


Figure 5.4-13b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Total PCBs Concentrations in
Surface Water by River Mile (RM 2-16), Scale Zoom







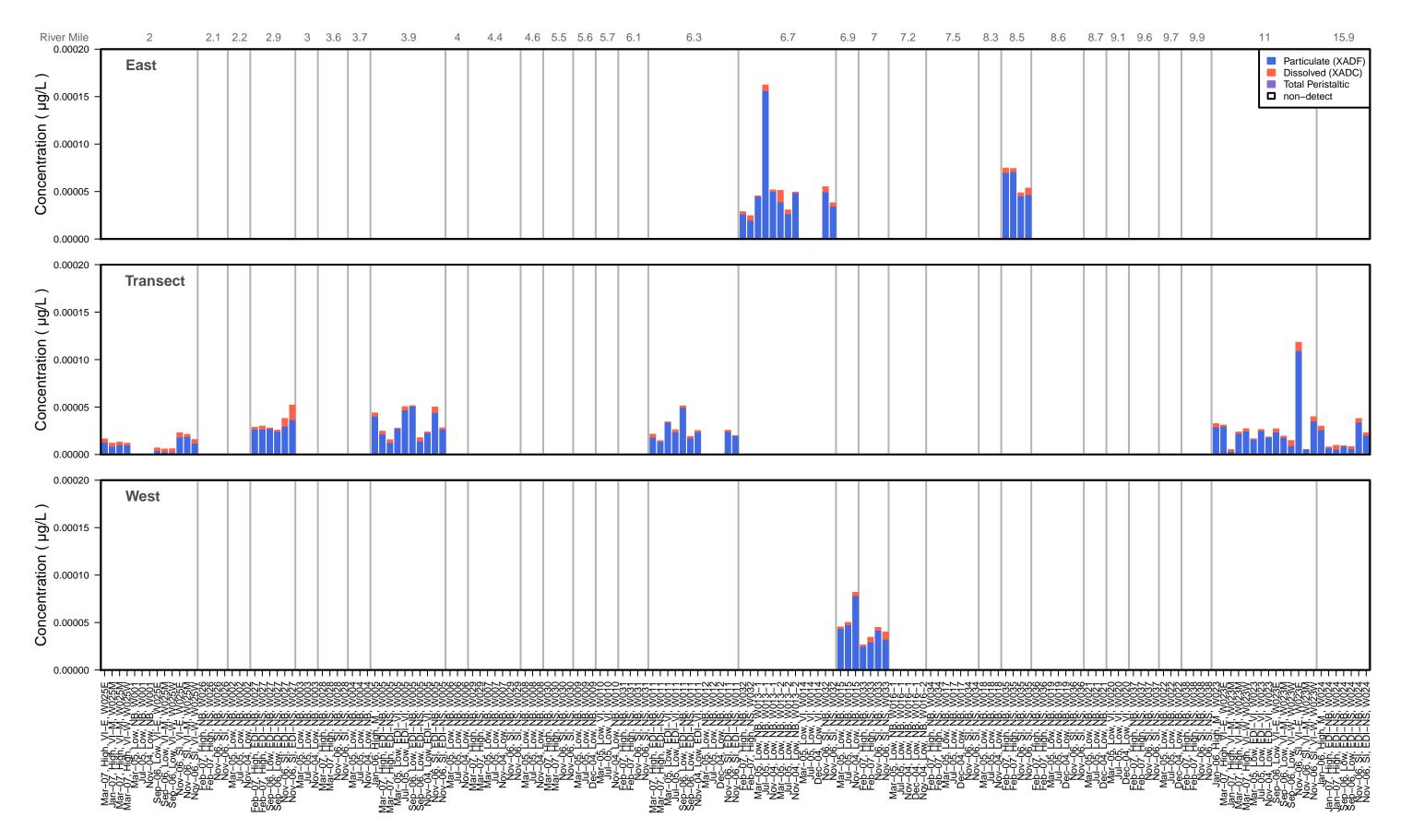


Figure 5.4–15
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total PCDD/Fs Concentrations in Surface Water, RM 2–16

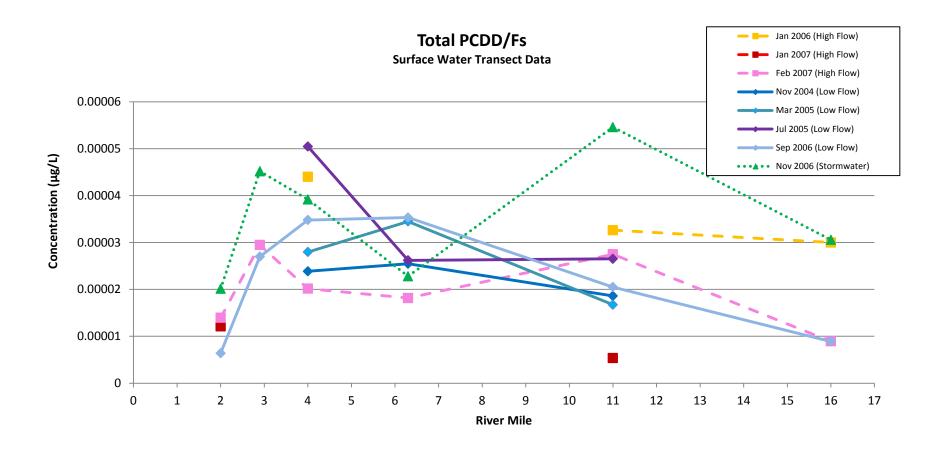


Figure 5.4-16
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Total PCDD/Fs Concentrations in
Surface Water by River Mile (RM 2–16)

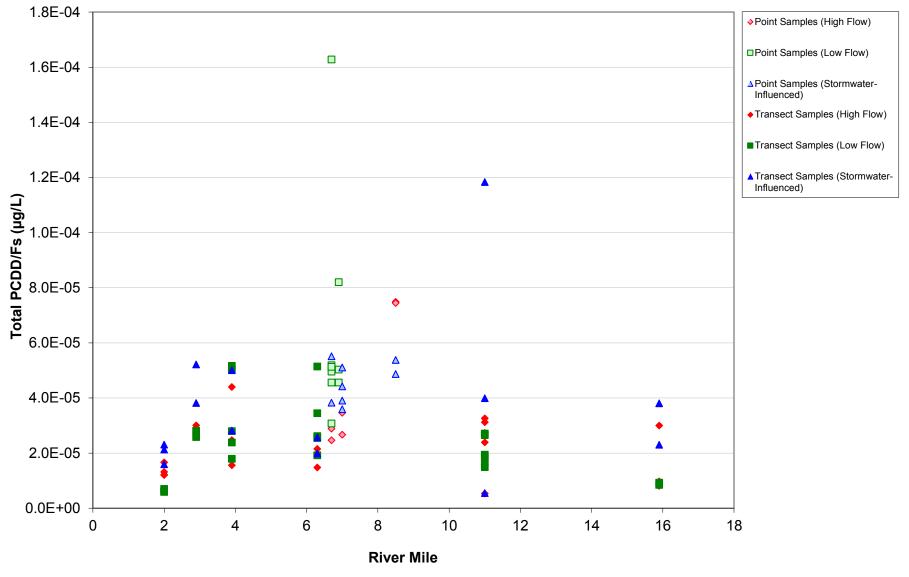
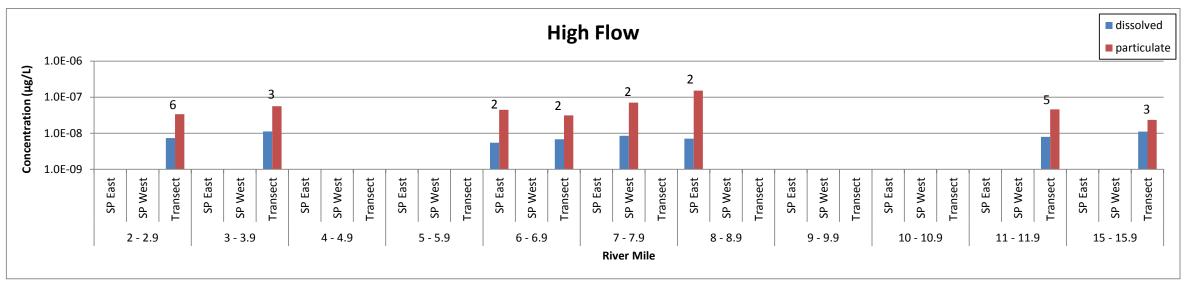
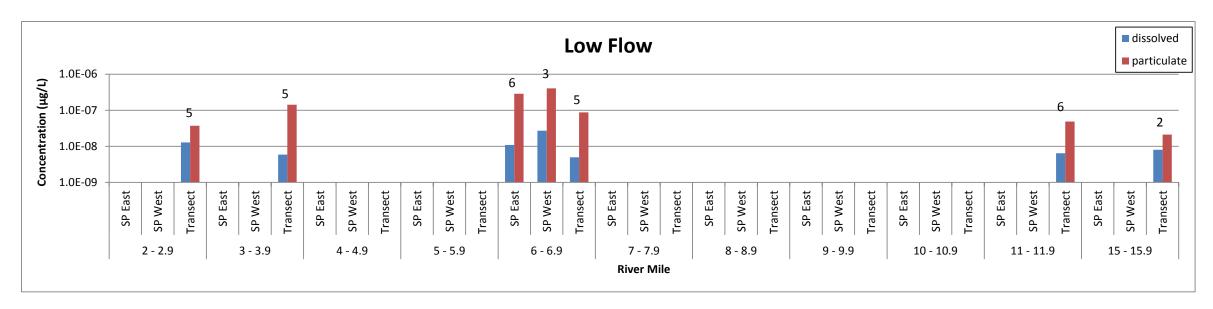
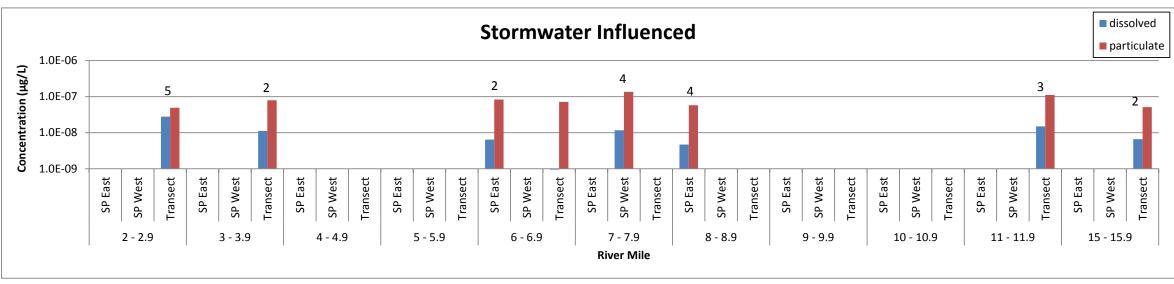


Figure 5.4-17
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Total PCDD/Fs Concentrations in
Surface Water by River Mile (RM 2-16)







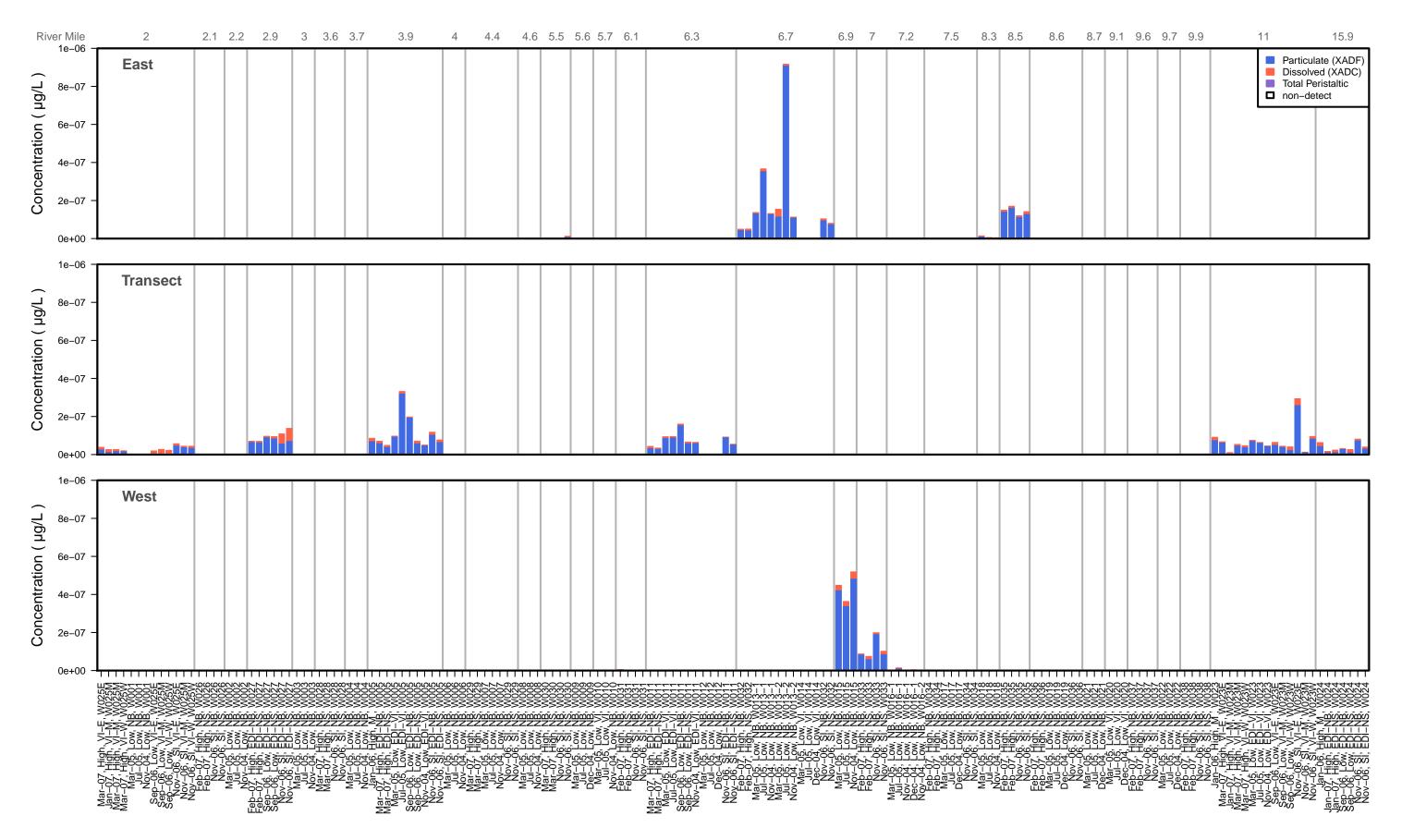


Figure 5.4–19a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of TCDD TEQ Concentrations in Surface Water, RM 2–16

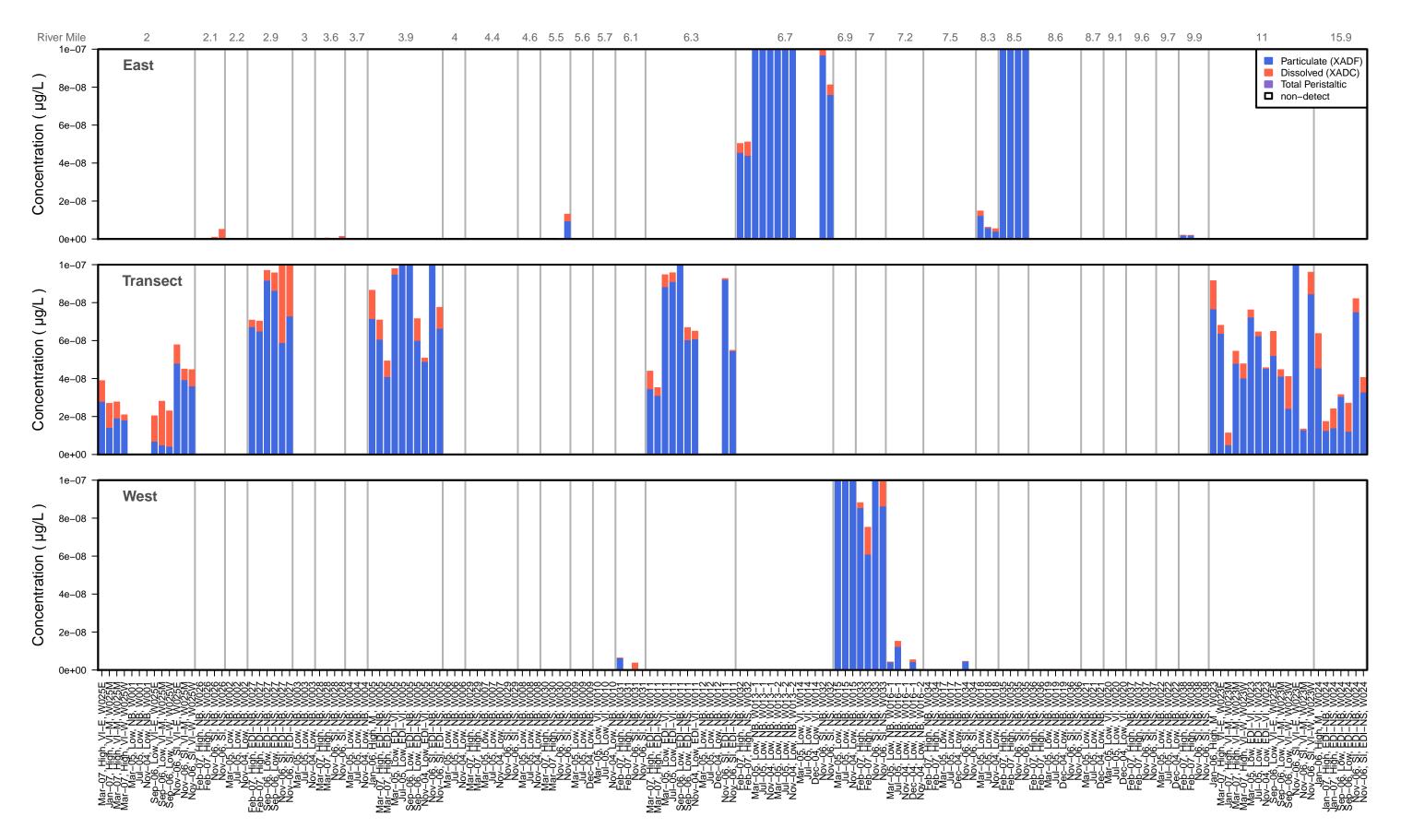
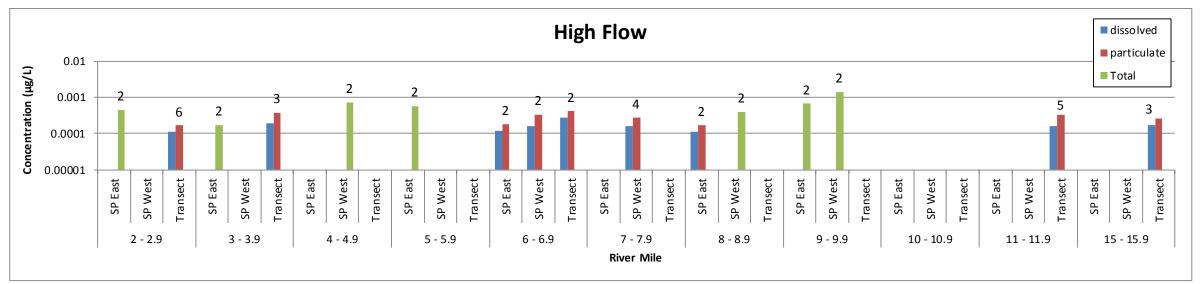
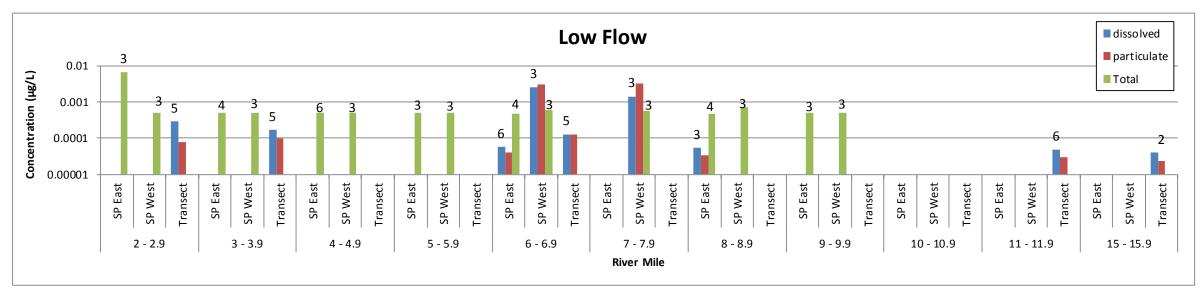
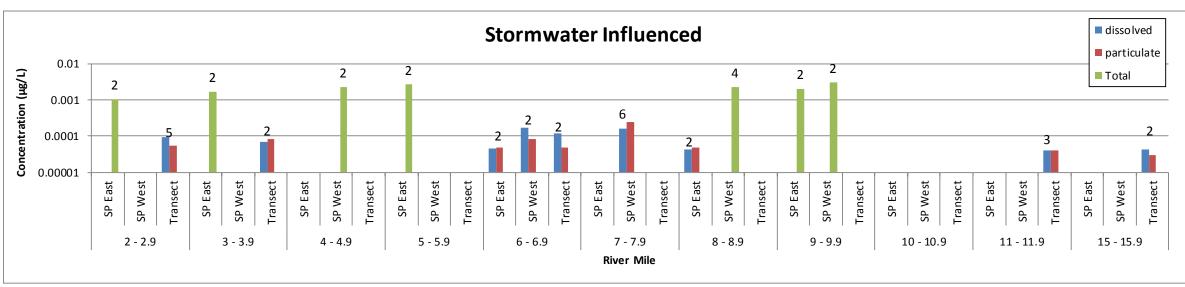


Figure 5.4–19b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of TCDD TEQ Concentrations in Surface Water, RM 2–16 (Scale Zoomed)







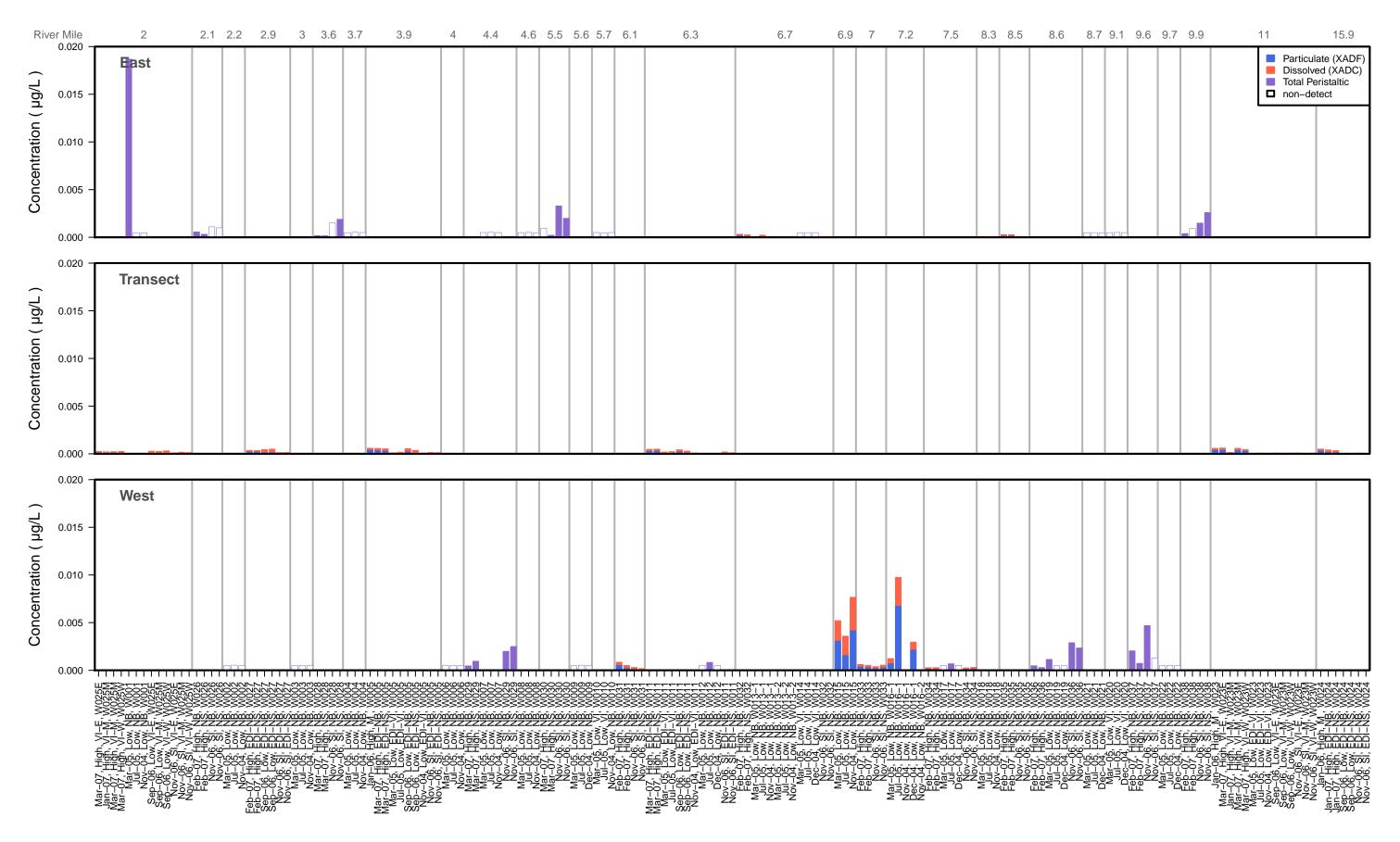


Figure 5.4–21a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of DDx Concentrations in Surface Water, RM 2–16

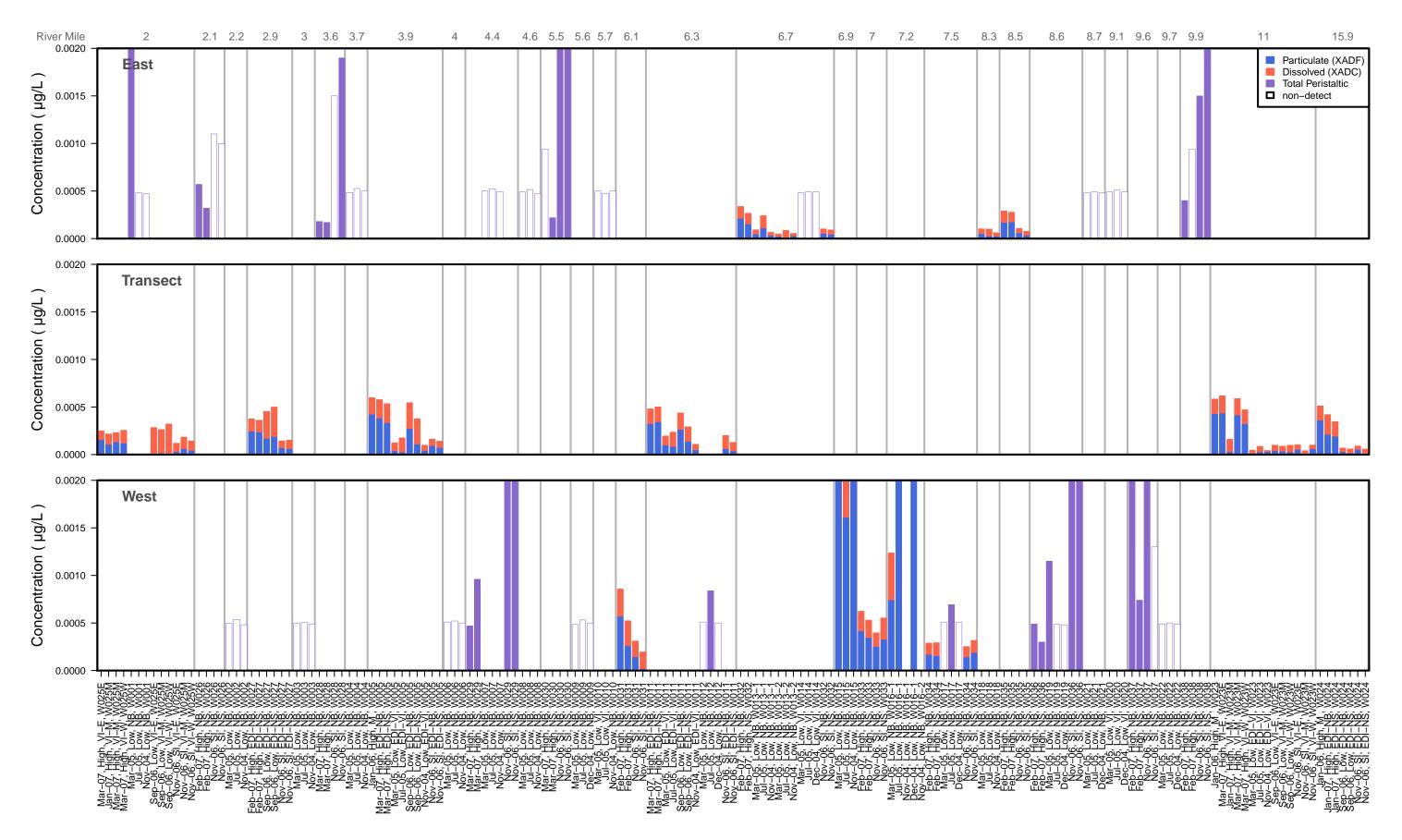


Figure 5.4–21b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of DDx Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

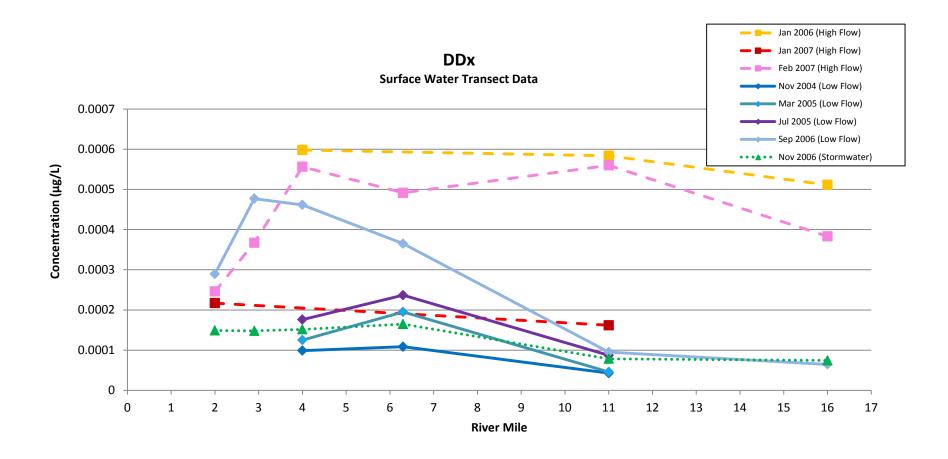


Figure 5.4-22
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect DDx Concentrations in
Surface Water by River Mile (RM 2–16)

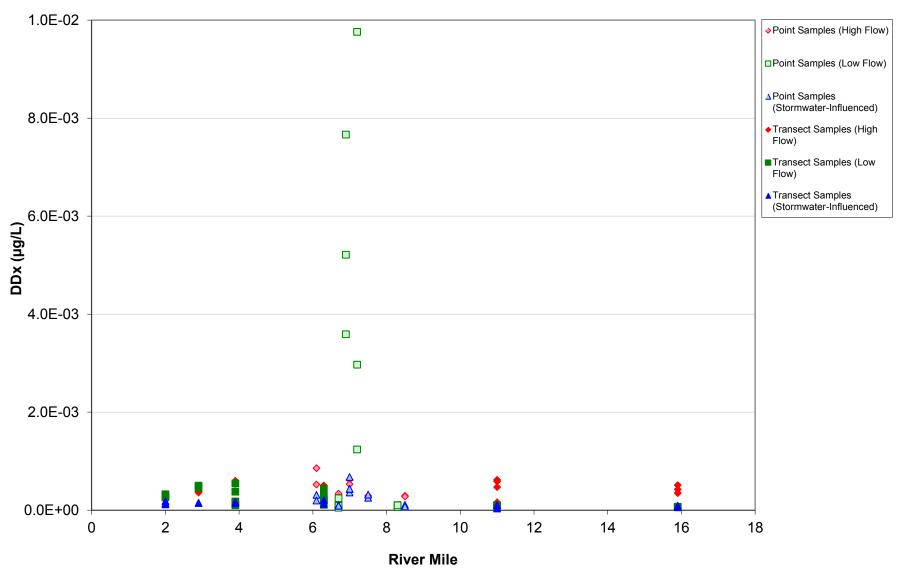


Figure 5.4-23a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected DDx Concentrations in
Surface Water by River Mile (RM 2-16)

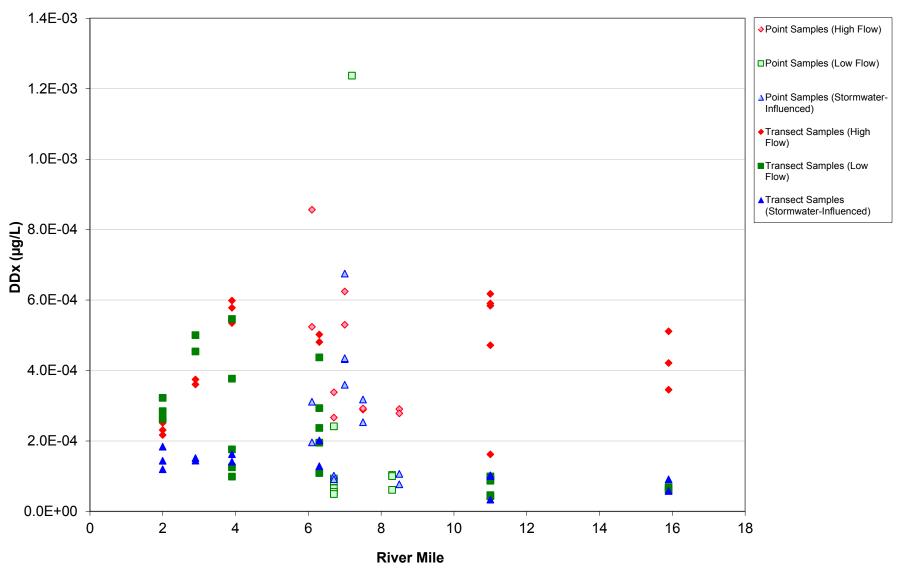
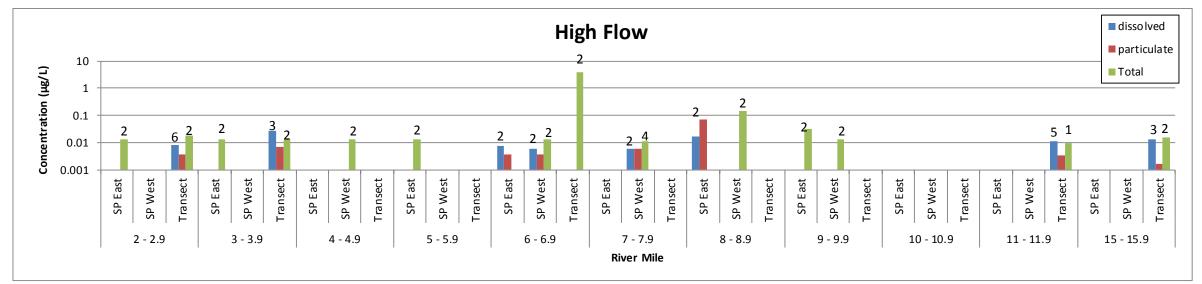
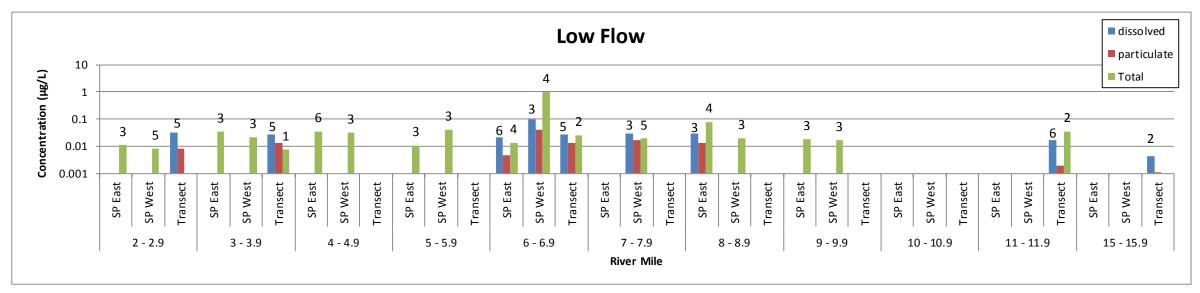
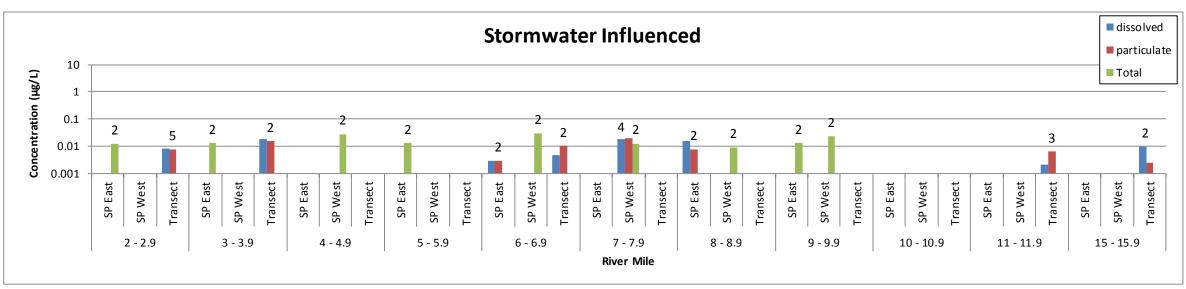


Figure 5.4-23b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected DDx Concentrations in
Surface Water by River Mile (RM 2-16), Scale Zoom







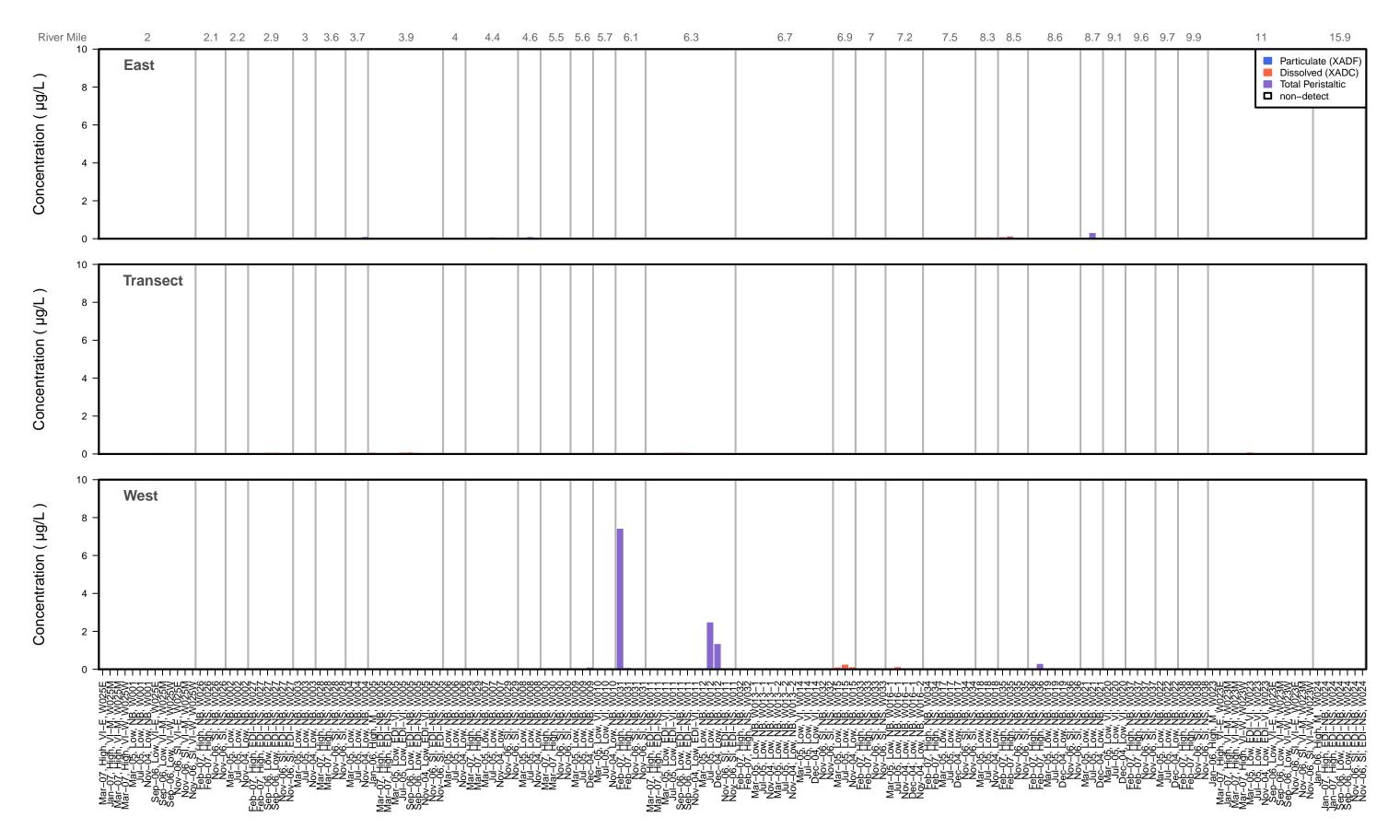


Figure 5.4–25a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total PAHs Concentrations in Surface Water, RM 2–16

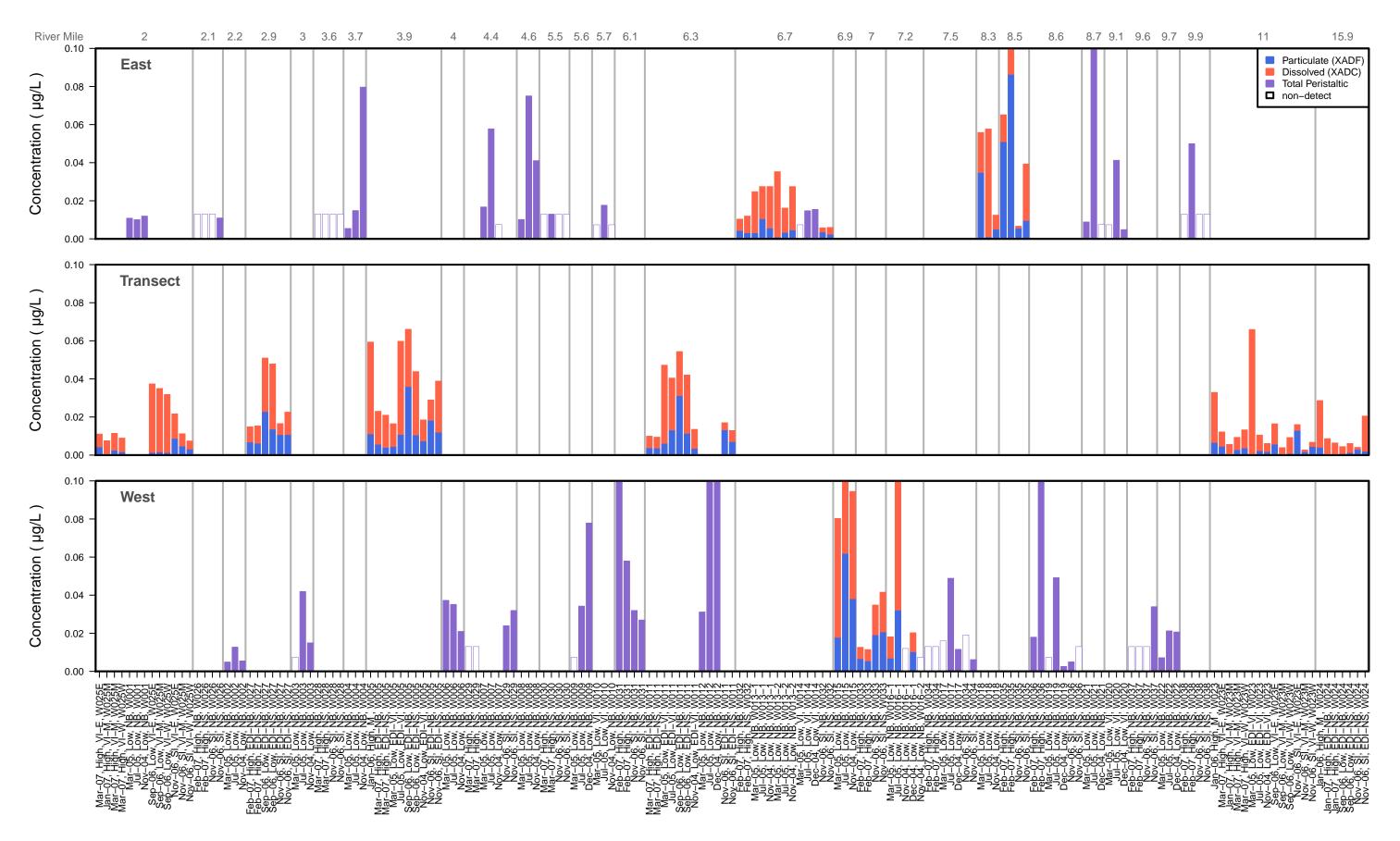


Figure 5.4–25b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total PAHs Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

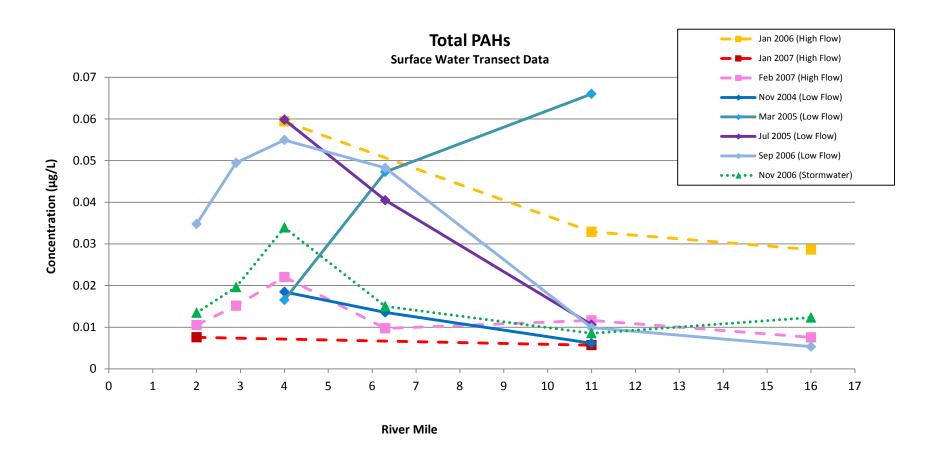


Figure 5.4-26
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Total PAHs Concentrations in
Surface Water by River Mile (RM 2–16)

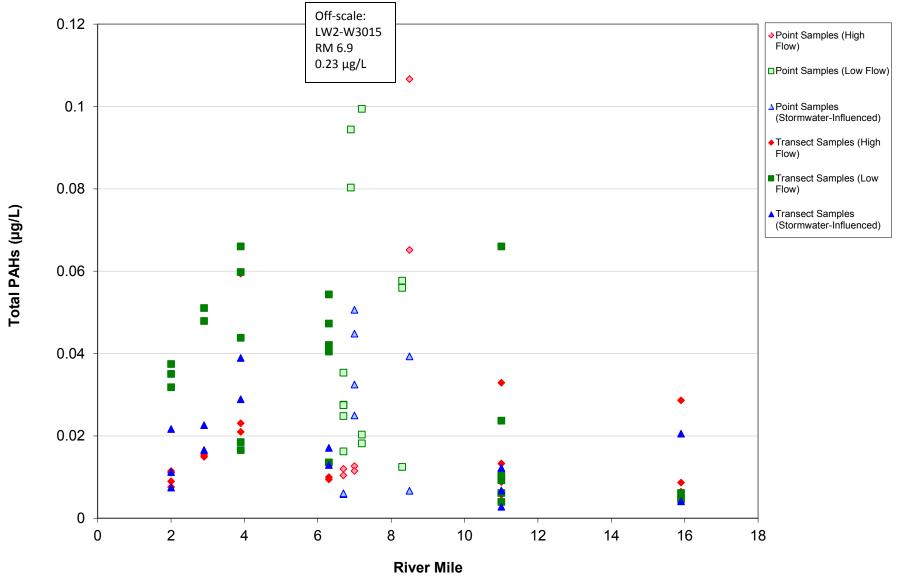
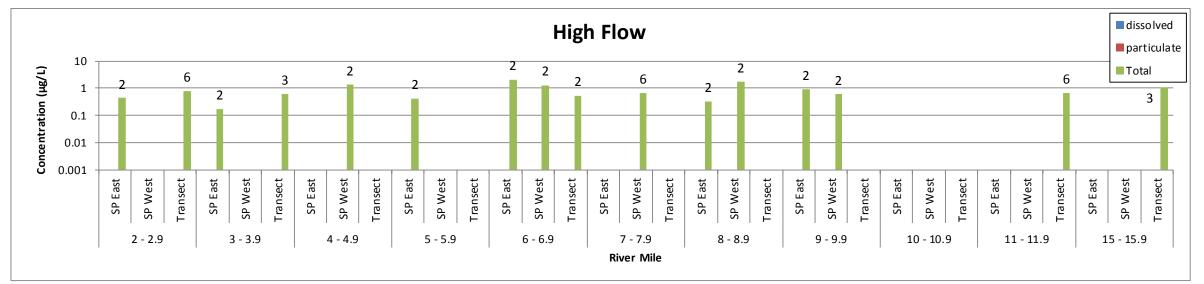
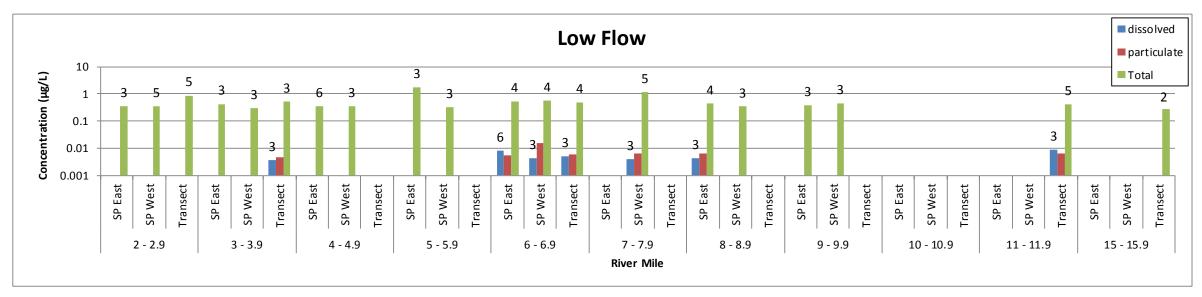
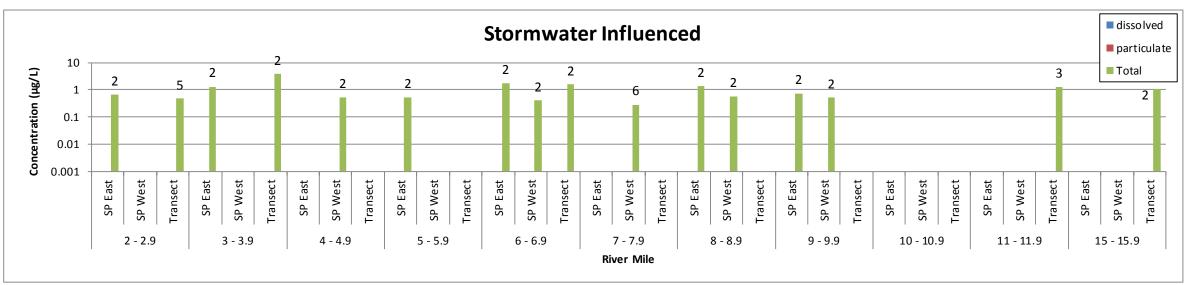


Figure 5.4-27
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Total PAHs Concentrations in
Surface Water by River Mile (RM 2-16)







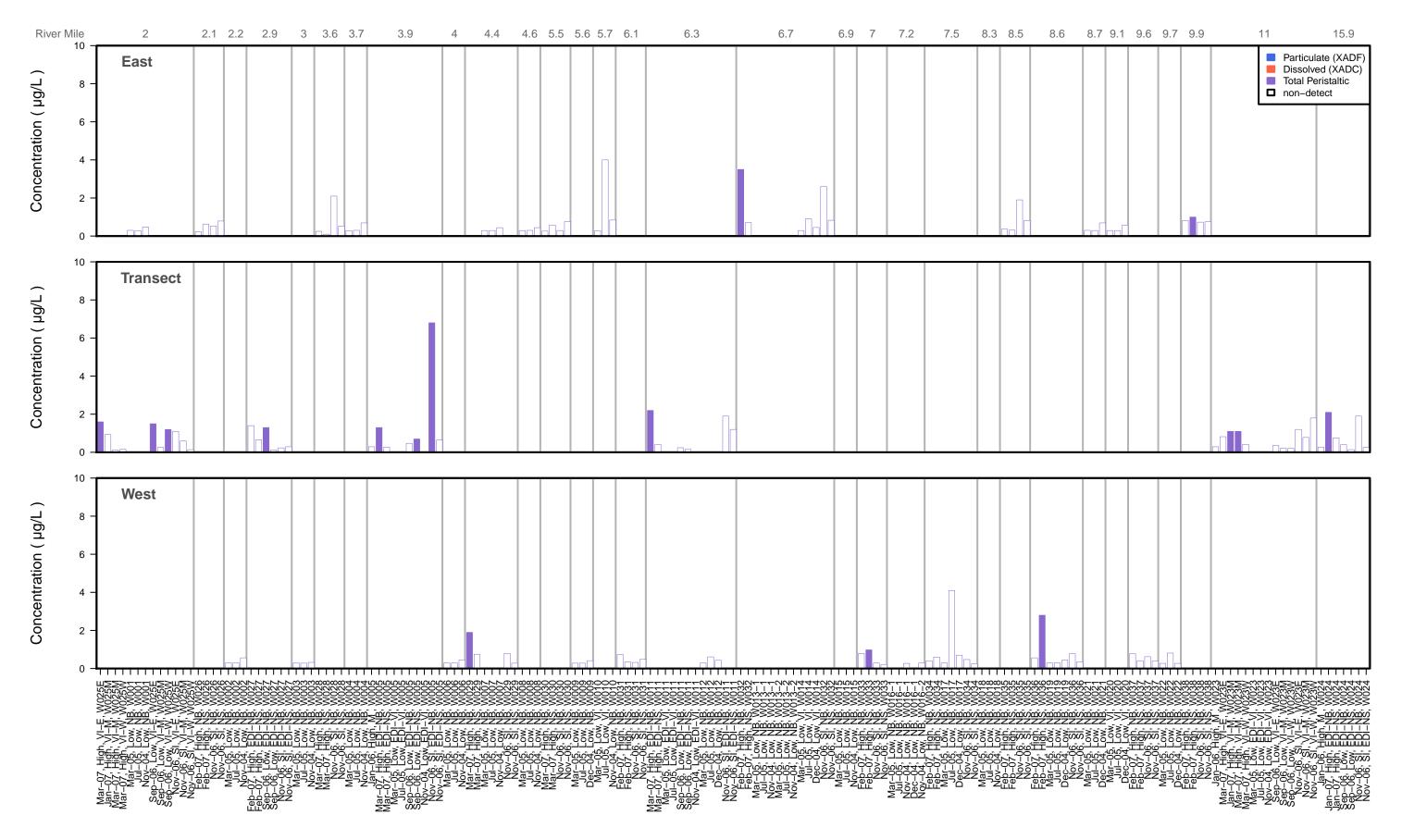


Figure 5.4–29a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of BEHP Concentrations in Surface Water, RM 2–16

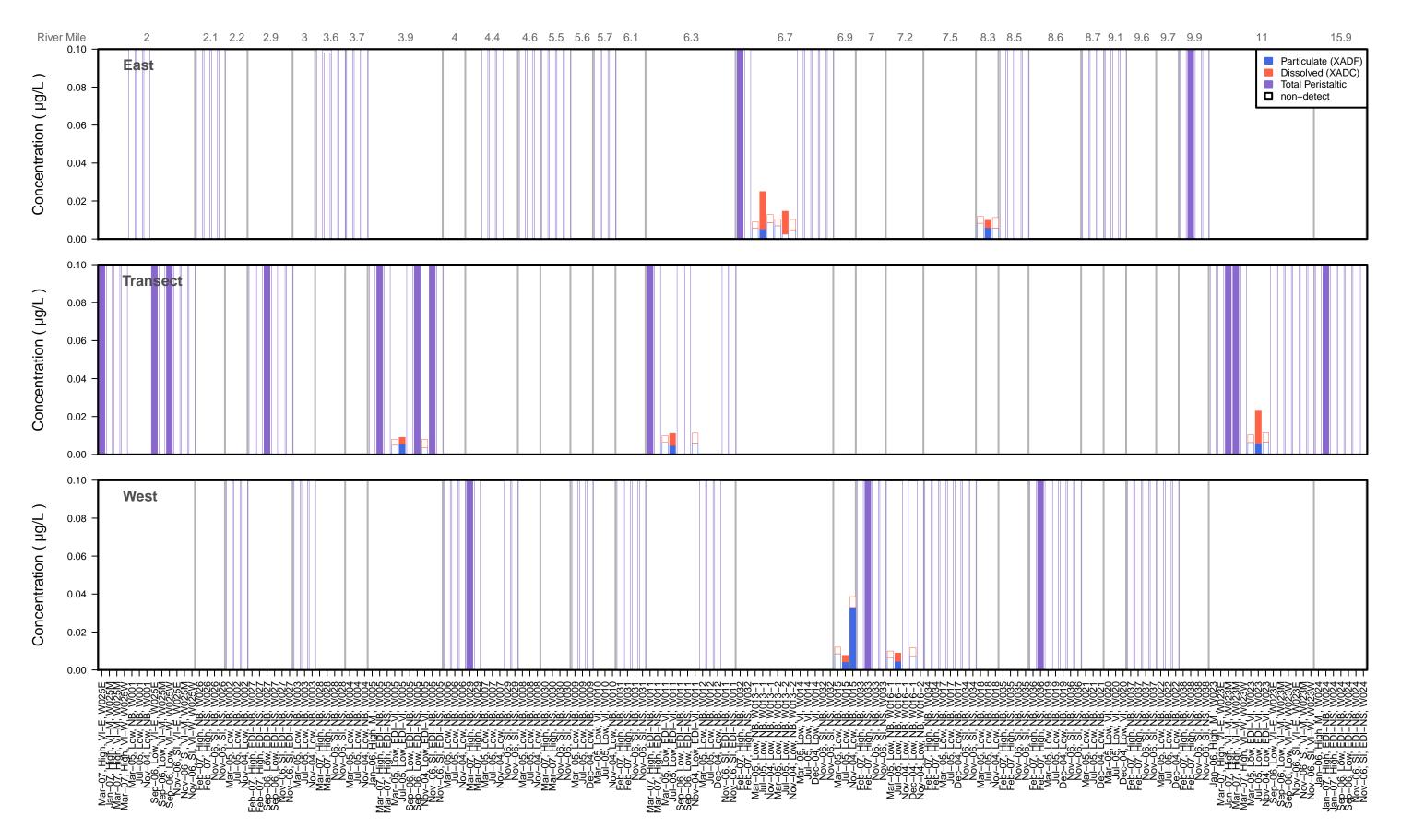


Figure 5.4–29b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of BEHP Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

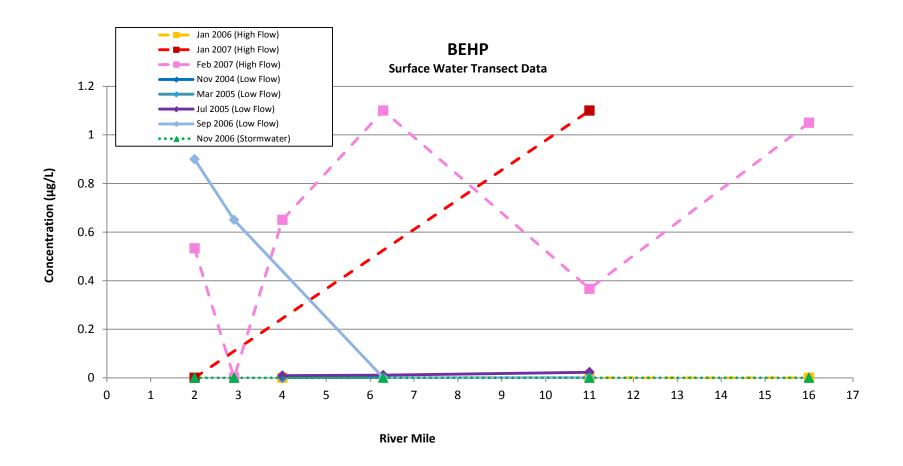


Figure 5.4-30
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect BEHP Concentrations in
Surface Water by River Mile (RM 2–16)

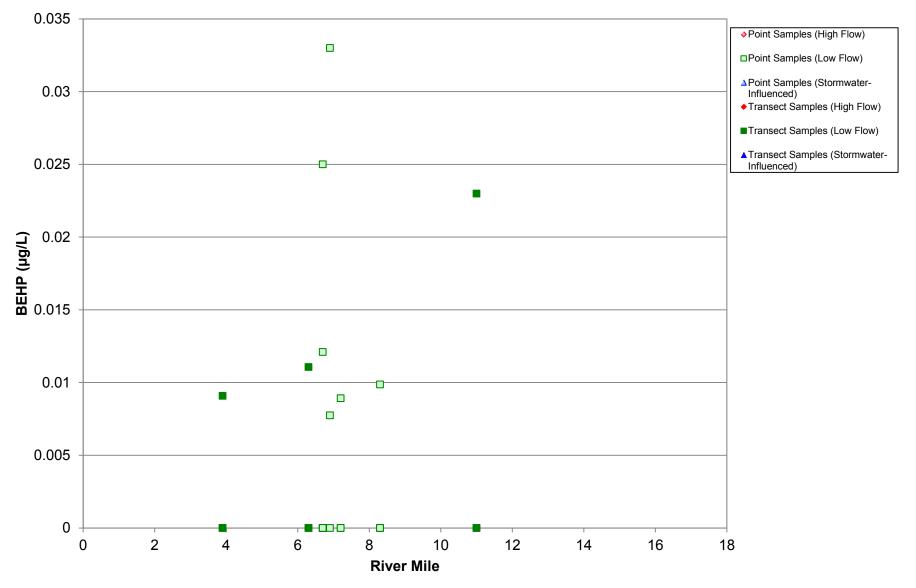
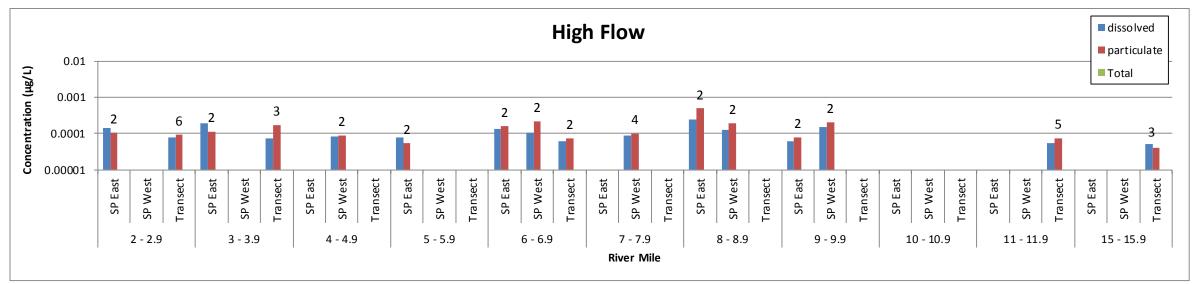
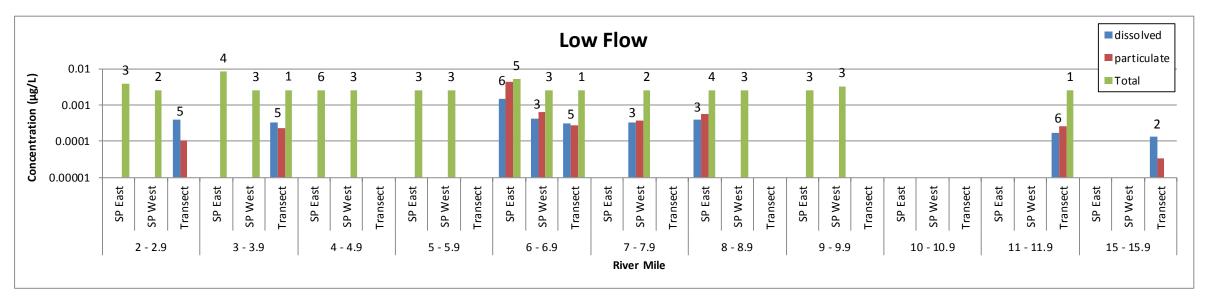
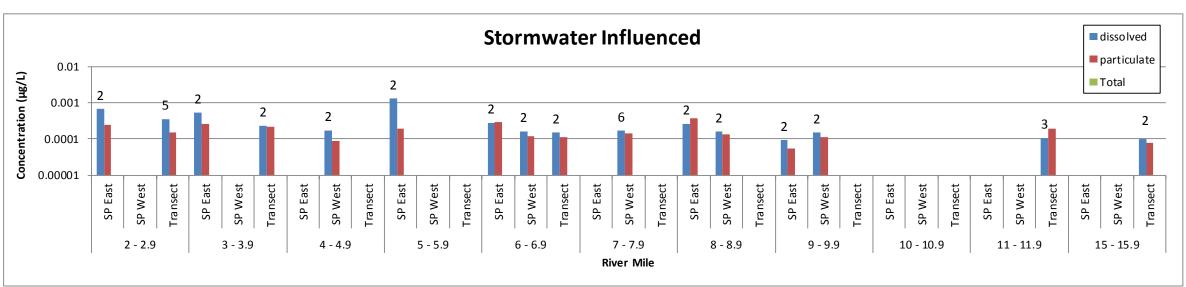


Figure 5.4-31
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected BEHP Concentrations in
Surface Water by River Mile (RM 2-16)







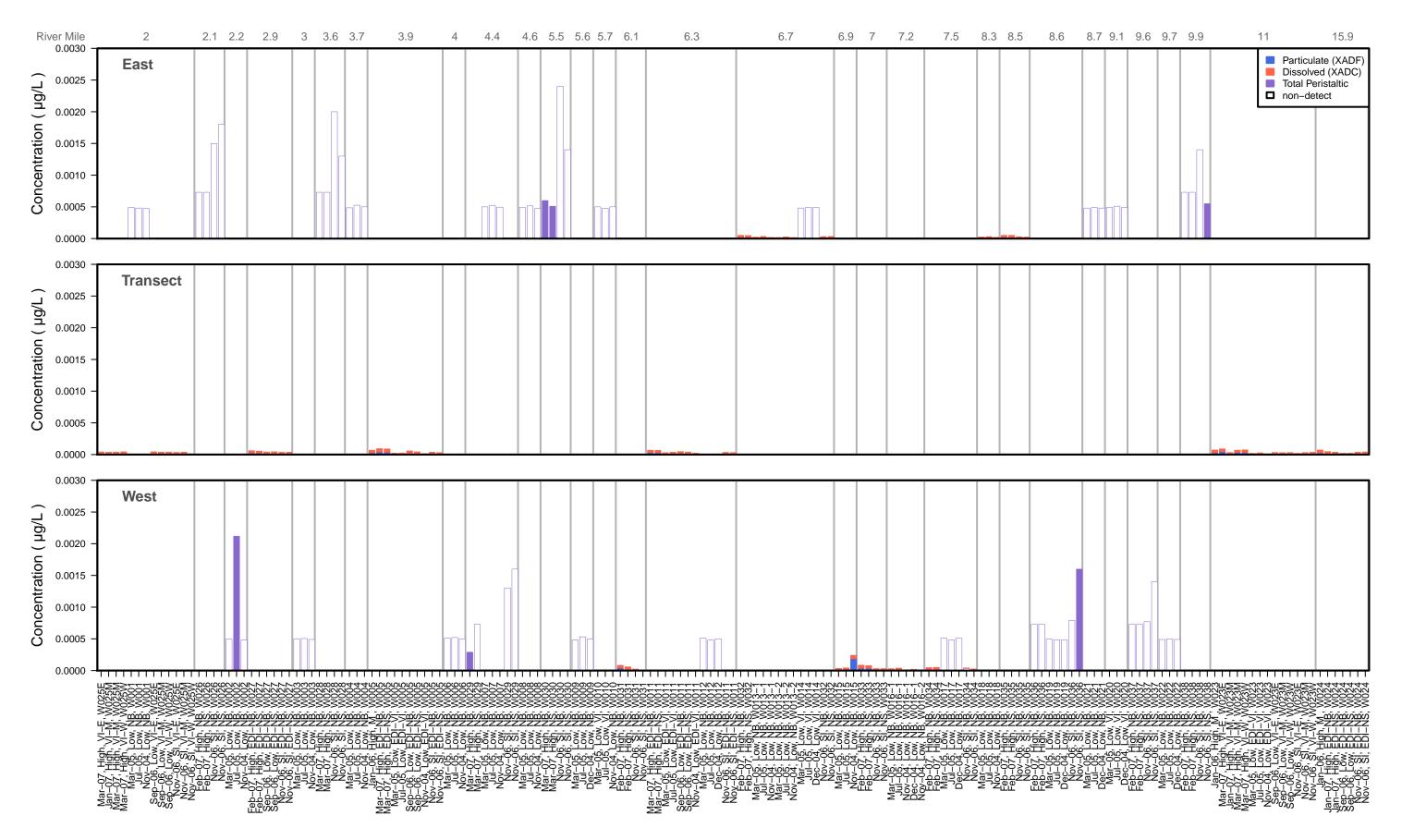


Figure 5.4–33a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total Chlordanes Concentrations in Surface Water, RM 2–16

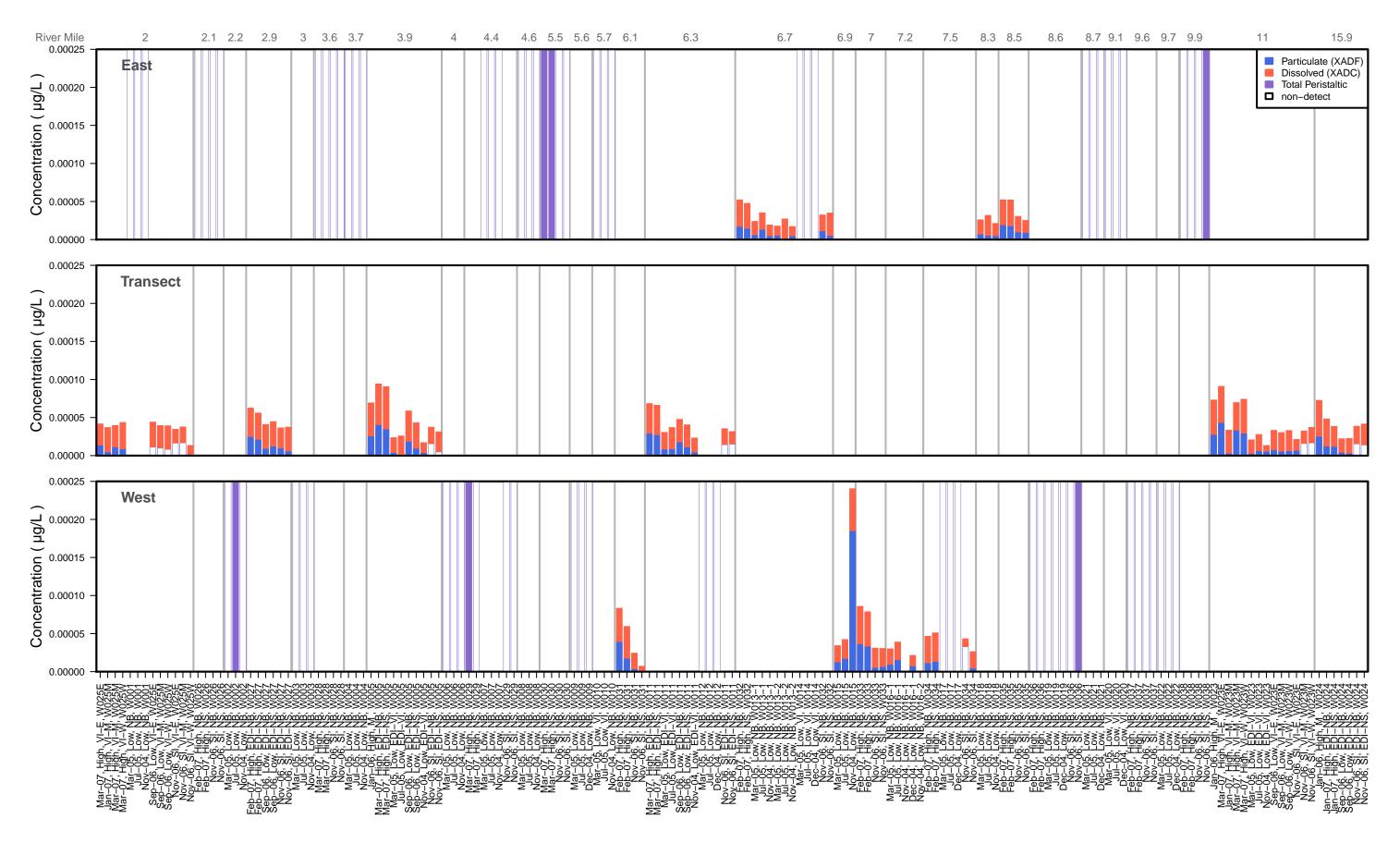


Figure 5.4– 33b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Total Chlordanes Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

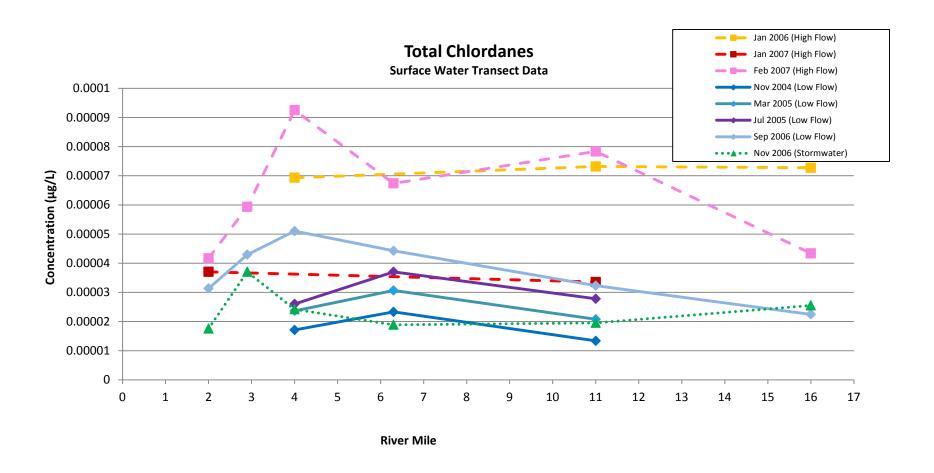


Figure 5.4-34
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Total Chlordanes Concentrations in
Surface Water by River Mile (RM 2–16)

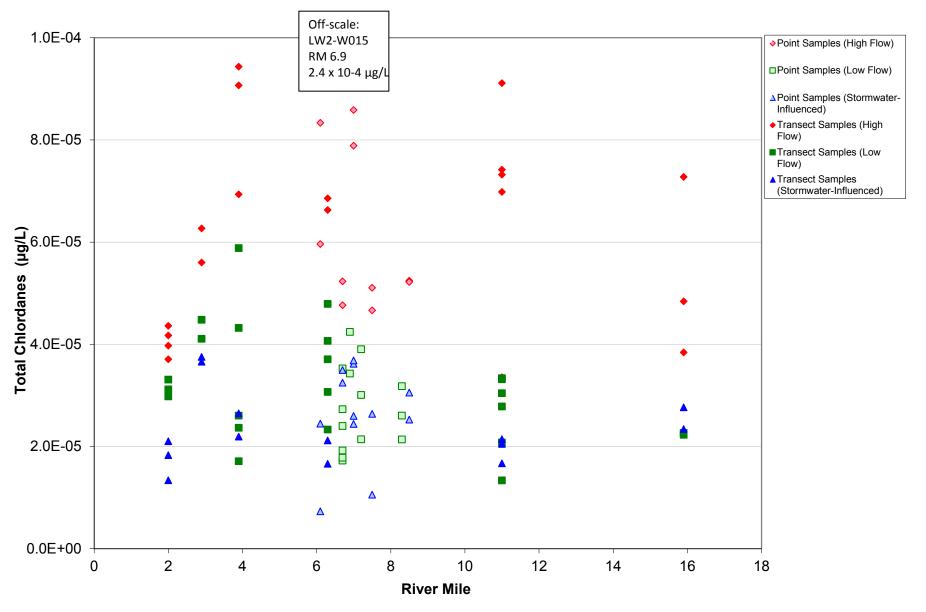
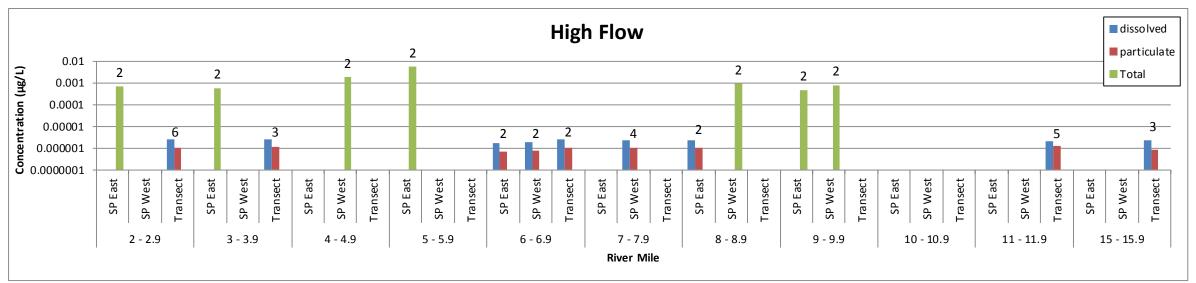
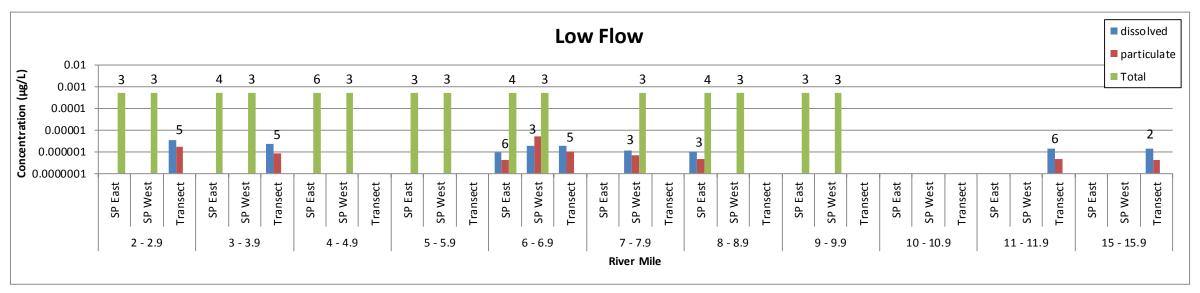
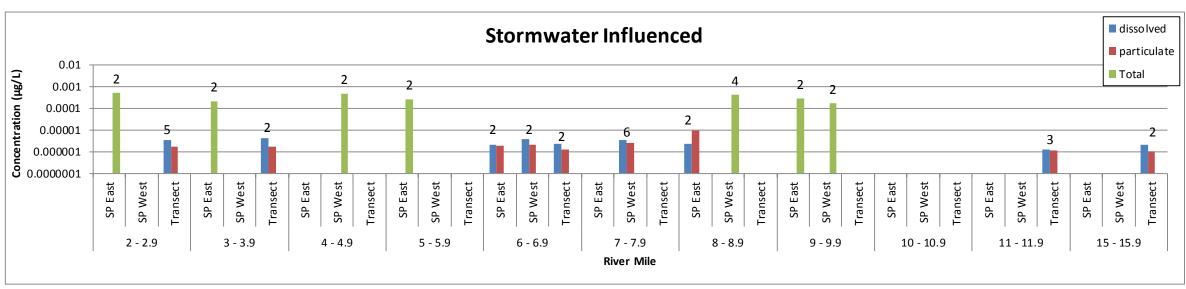


Figure 5.4-35
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Total Chlordanes Concentrations in
Surface Water by River Mile (RM 2-16)







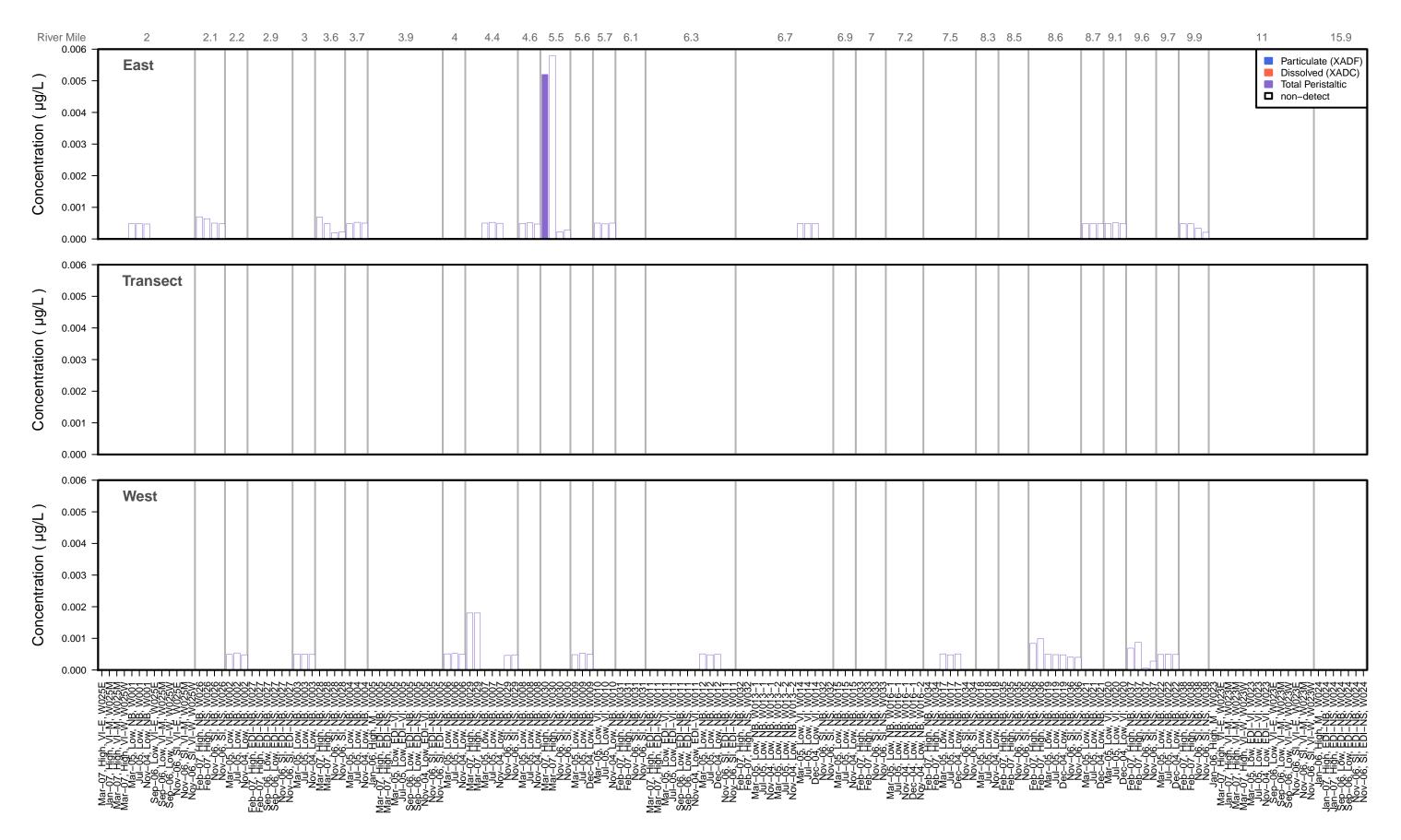


Figure 5.4–37a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Aldrin Concentrations in Surface Water, RM 2–16

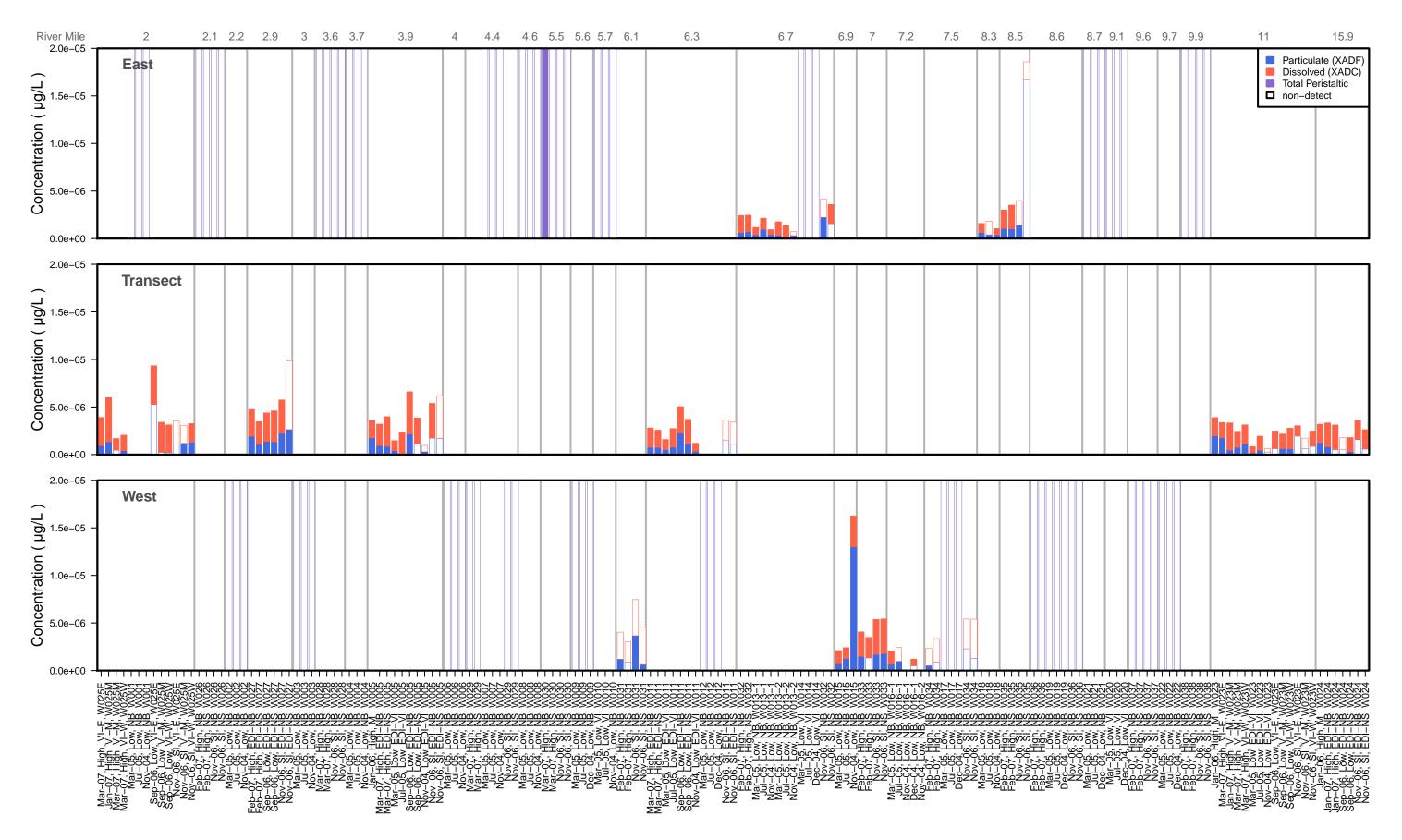


Figure 5.4–37b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Aldrin Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

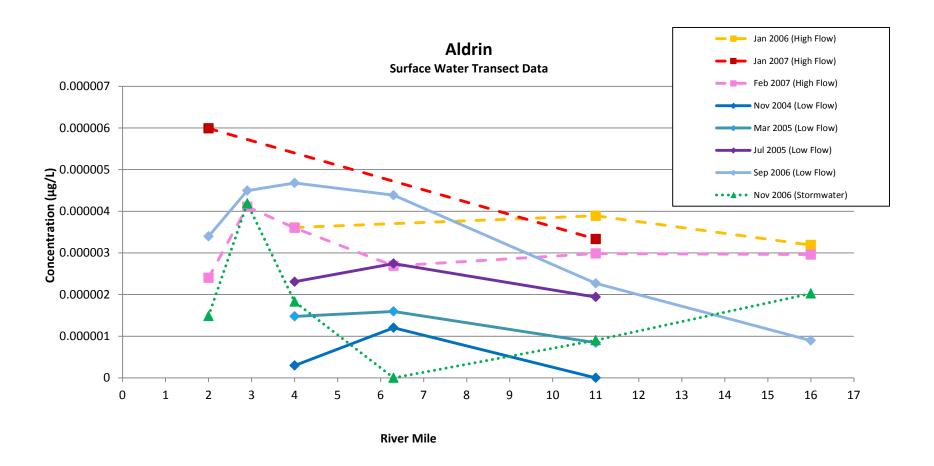


Figure 5.4-38
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Aldrin Concentrations in
Surface Water by River Mile (RM 2–16)

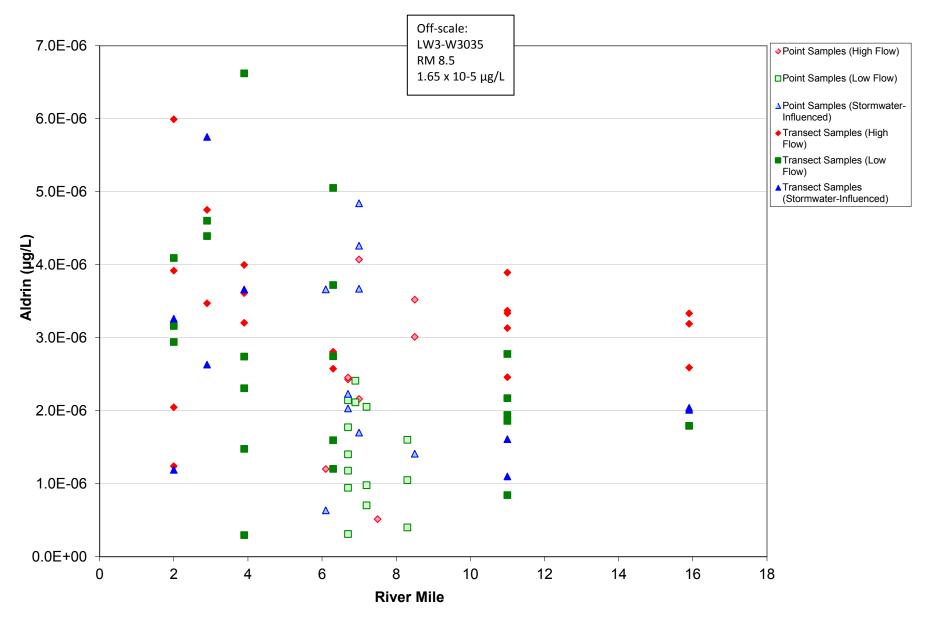
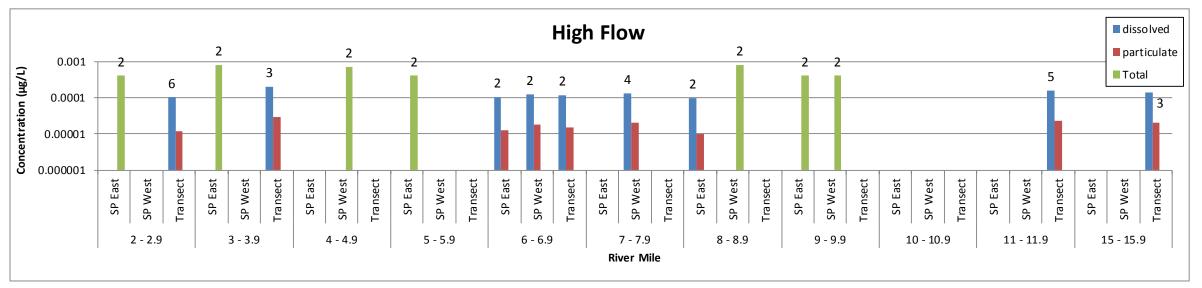
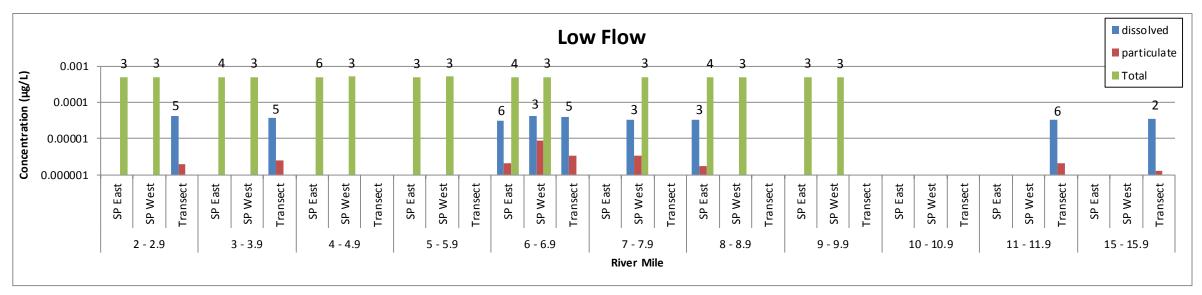
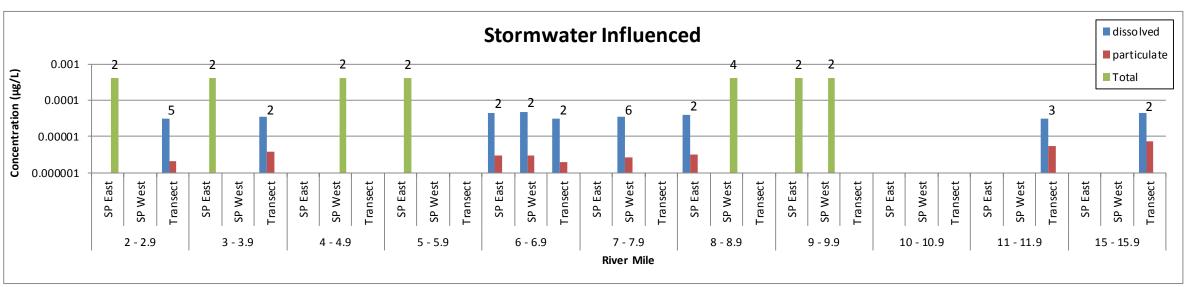


Figure 5.4-39
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Aldrin Concentrations in
Surface Water by River Mile (RM 2-16)







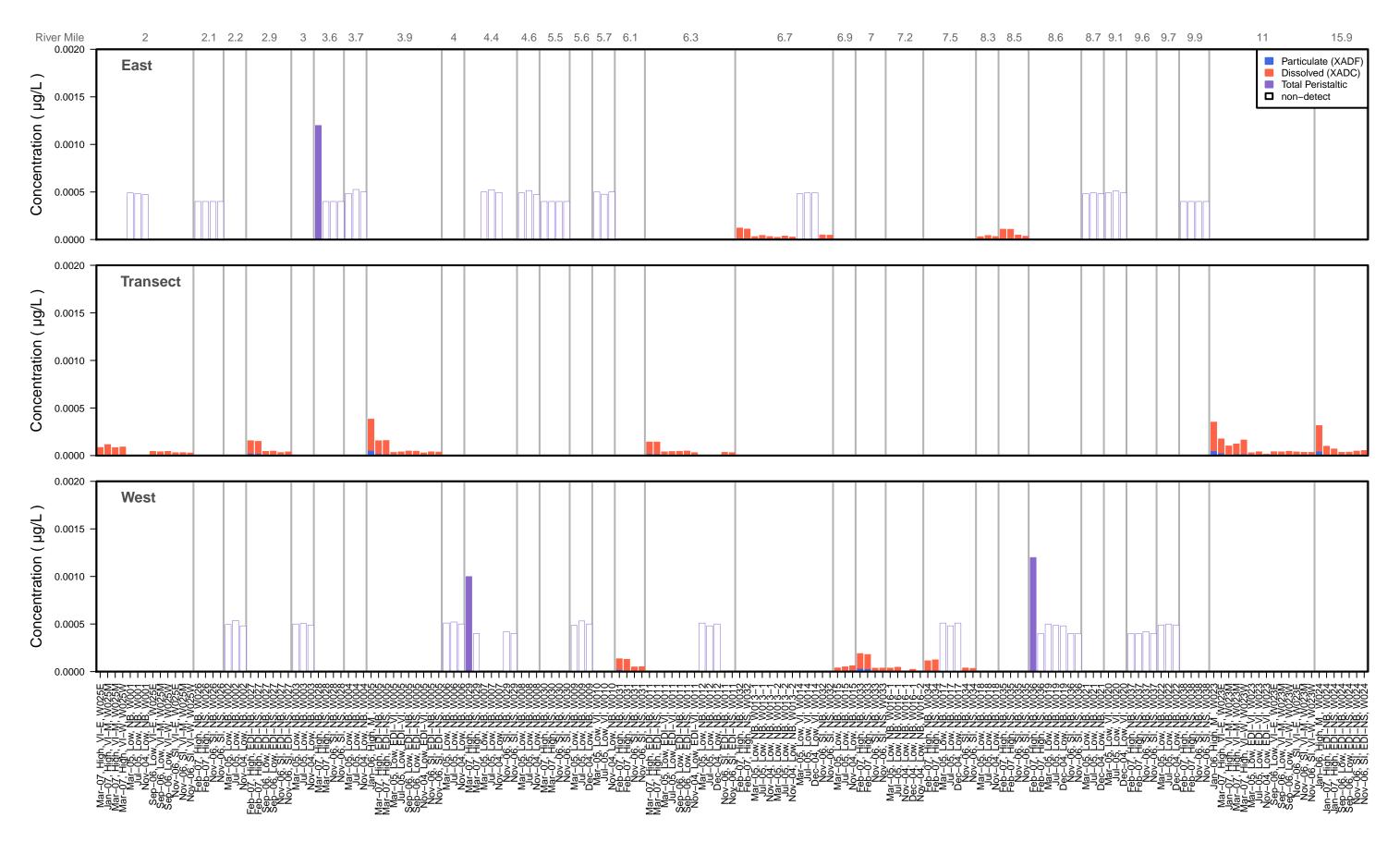


Figure 5.4–41a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Dieldrin Concentration in Surface Water, RM 2–16

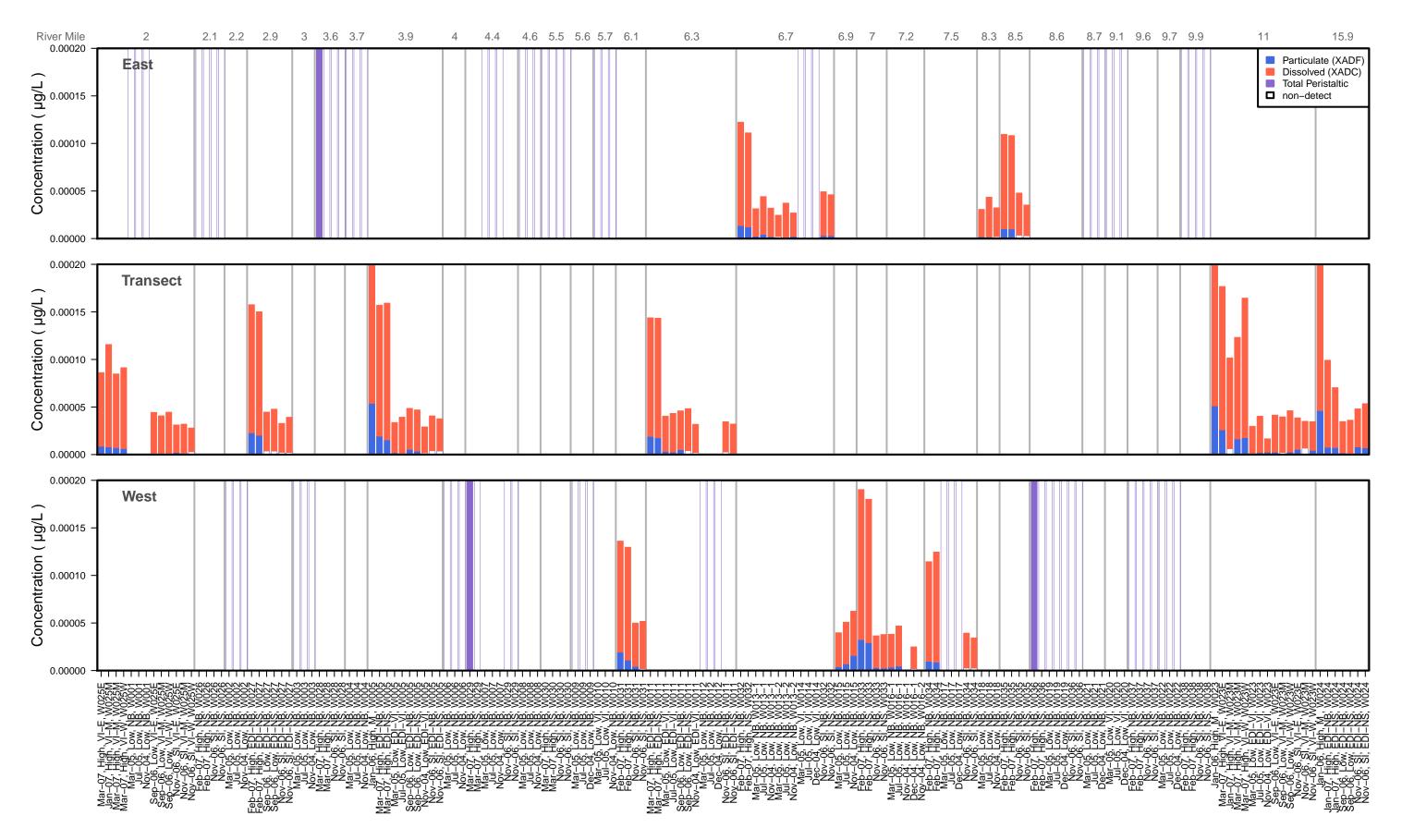


Figure 5.4–41b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Dieldrin Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

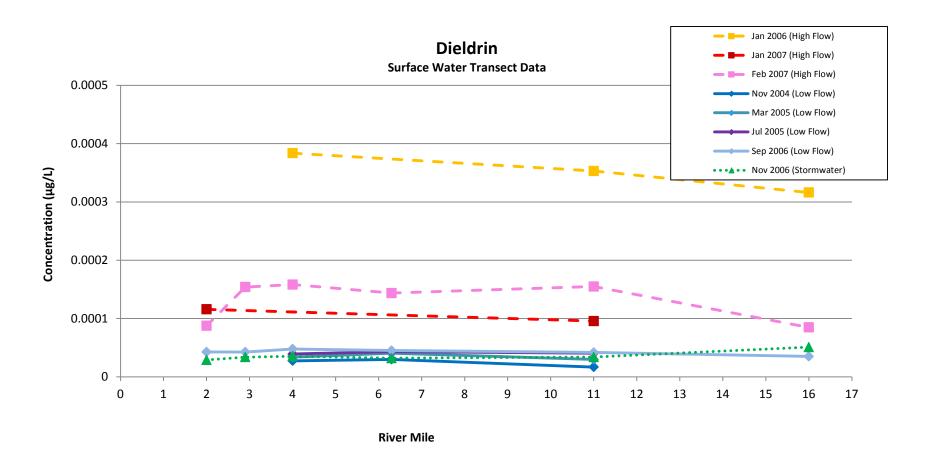


Figure 5.4-42
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Dieldrin Concentrations in
Surface Water by River Mile (RM 2–16)

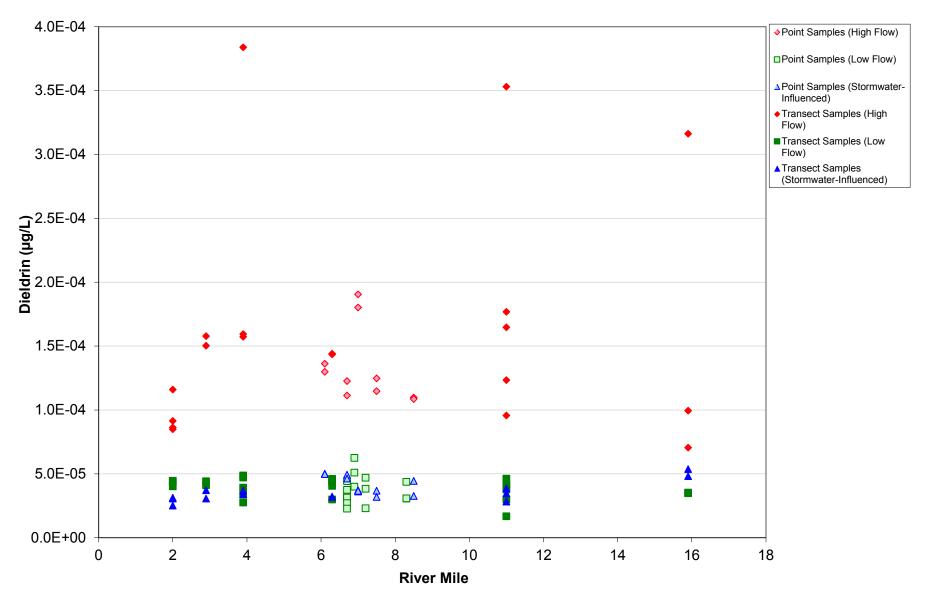
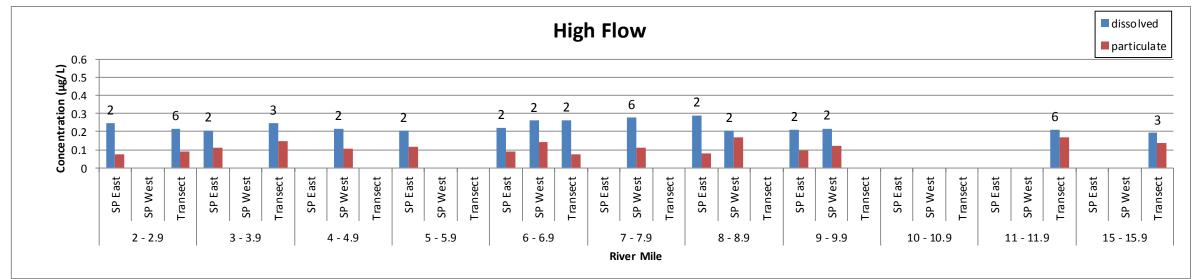
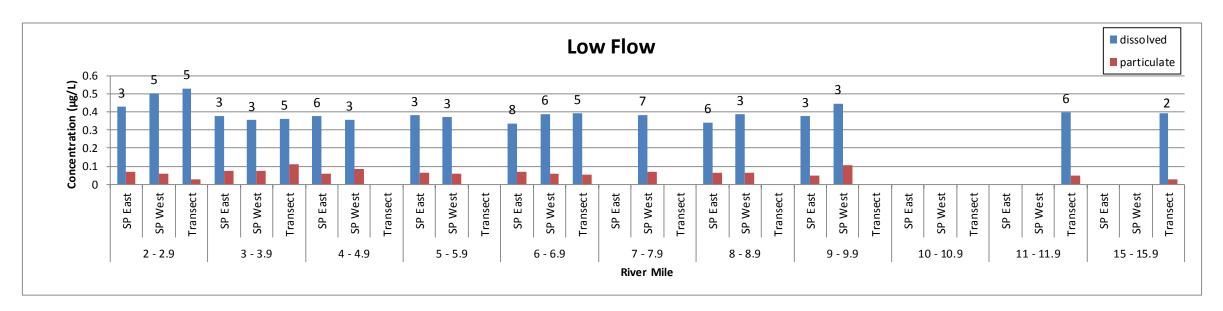
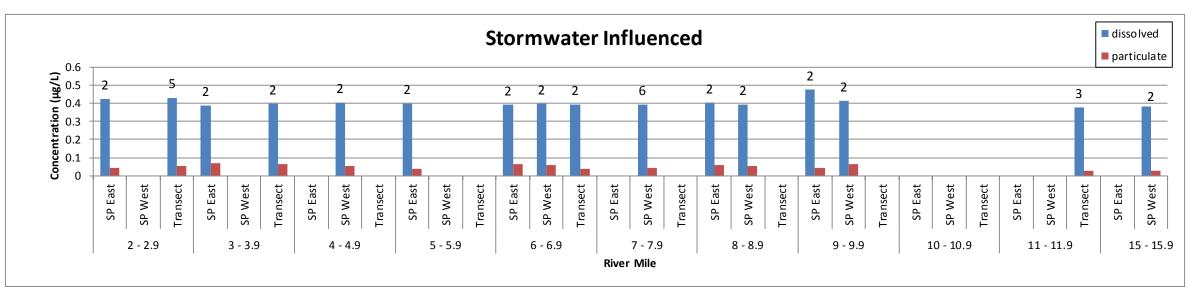


Figure 5.4-43
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Dieldrin Concentrations in
Surface Water by River Mile (RM 2-16)







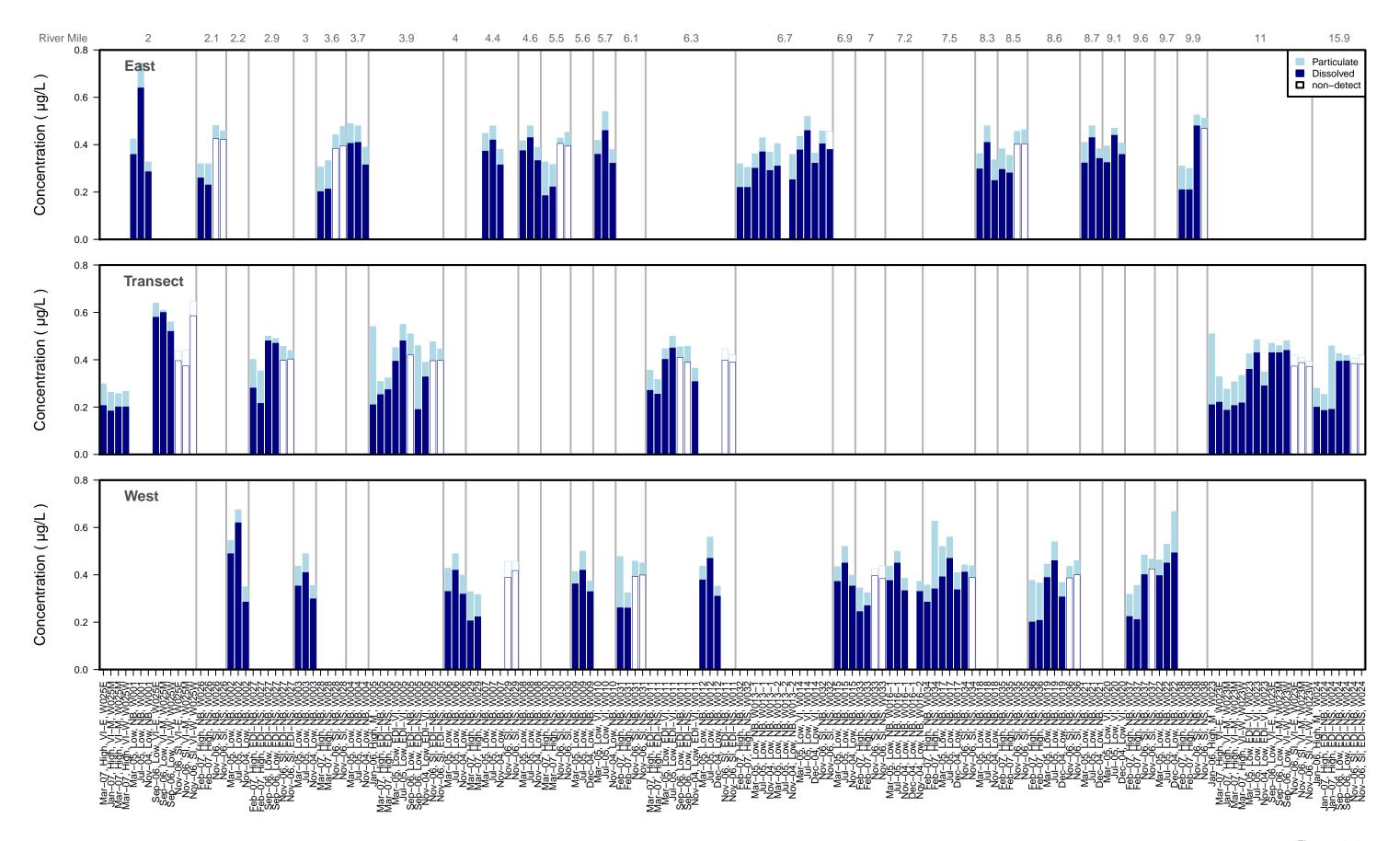


Figure 5.4–45
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Arsenic Concentrations in Surface Water, RM 2–16

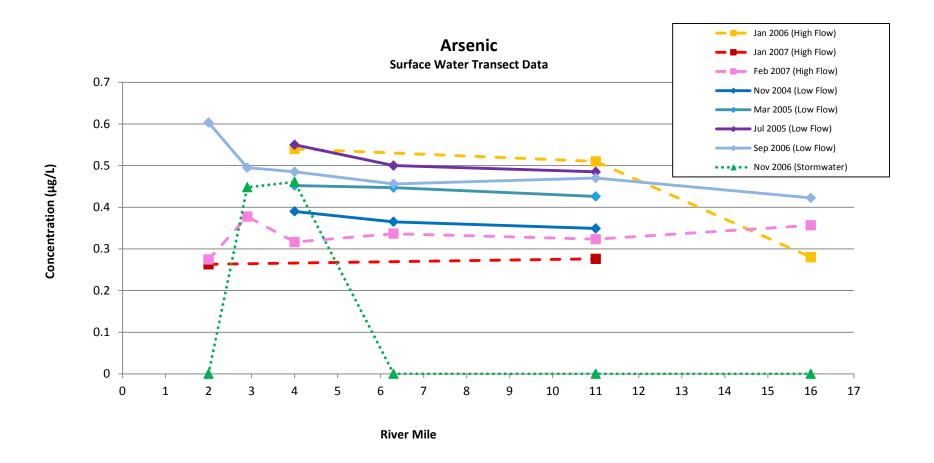


Figure 5.4-46
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Arsenic Concentrations in
Surface Water by River Mile (RM 2–16)

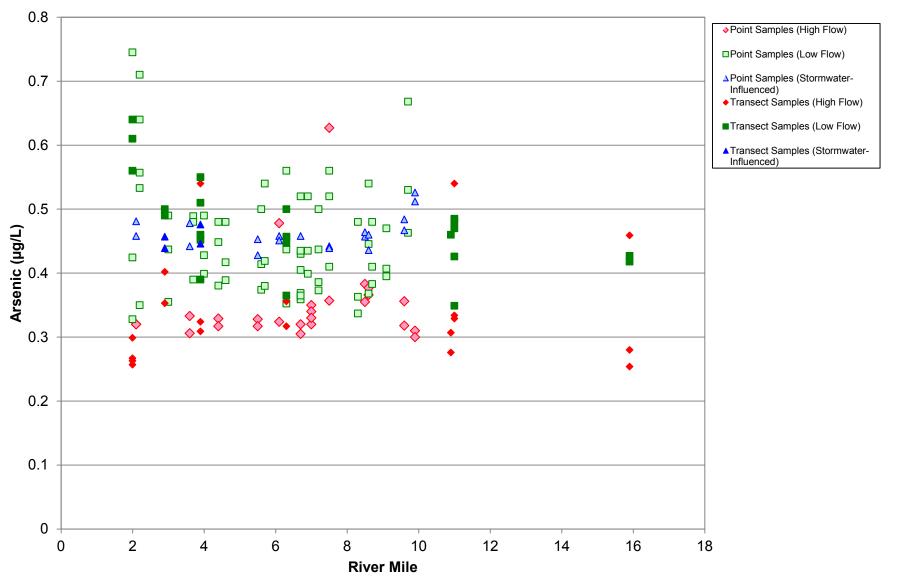
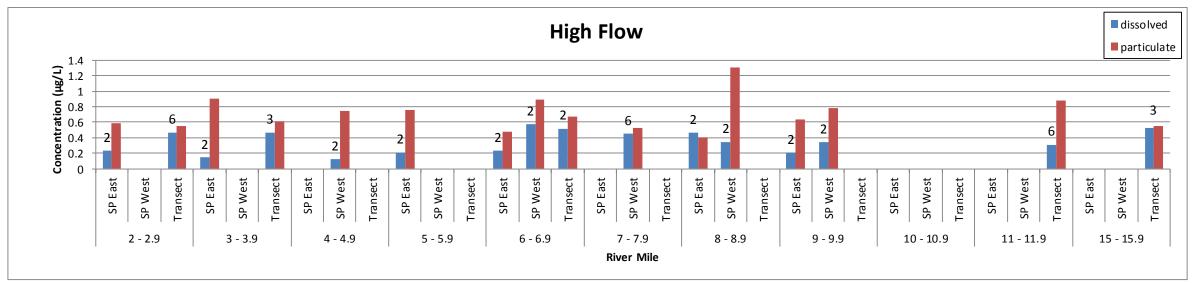
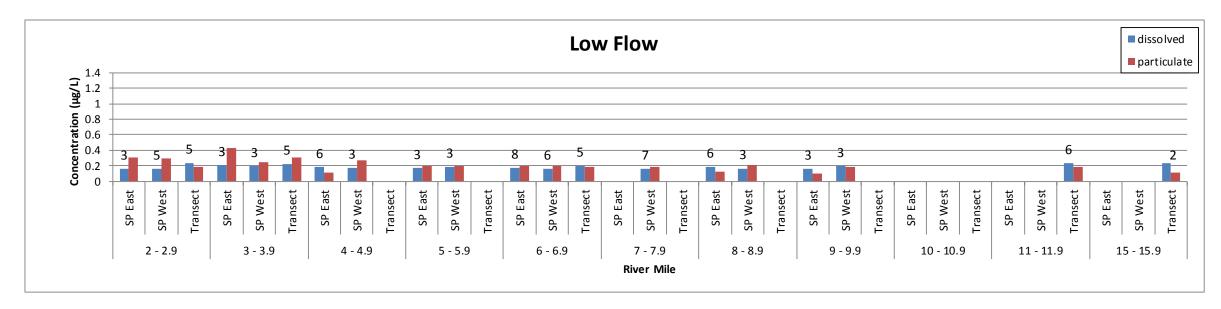
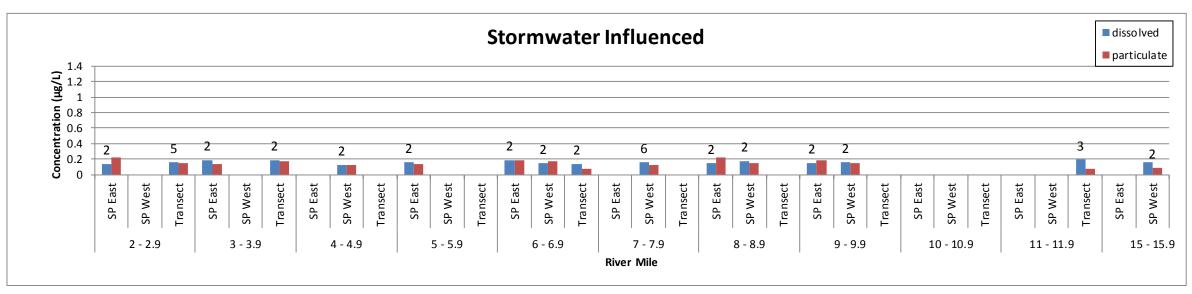


Figure 5.4-47
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Arsenic Concentrations in
Surface Water by River Mile (RM 2-16)







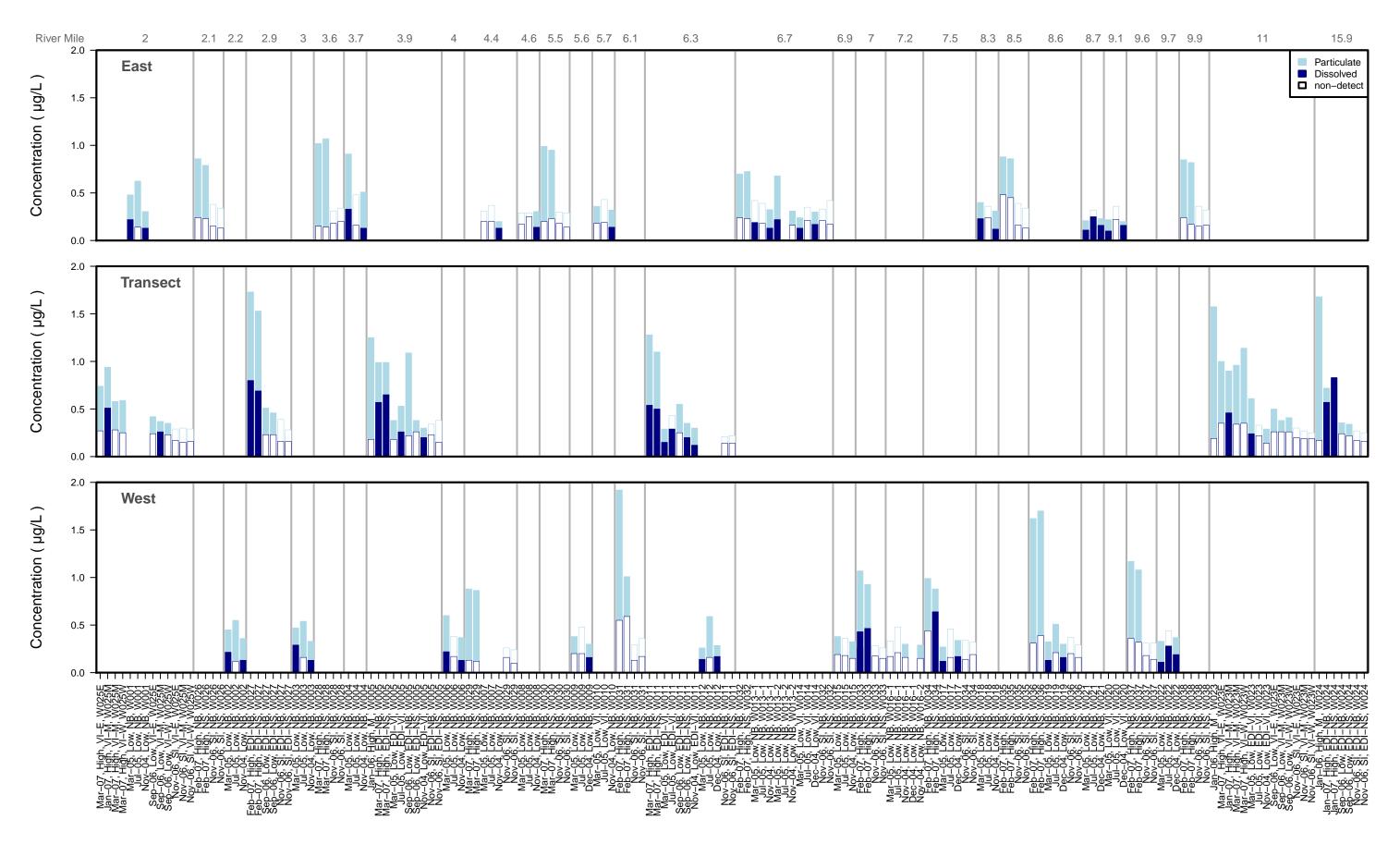


Figure 5.4–49
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Chromium Concentrations in Surface Water, RM 2–16

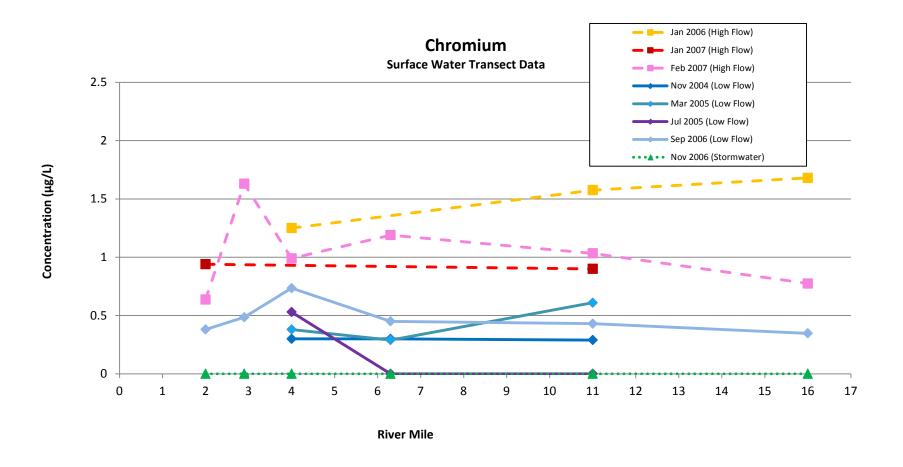


Figure 5.4-50
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Chromium Concentrations in
Surface Water by River Mile (RM 2–16)

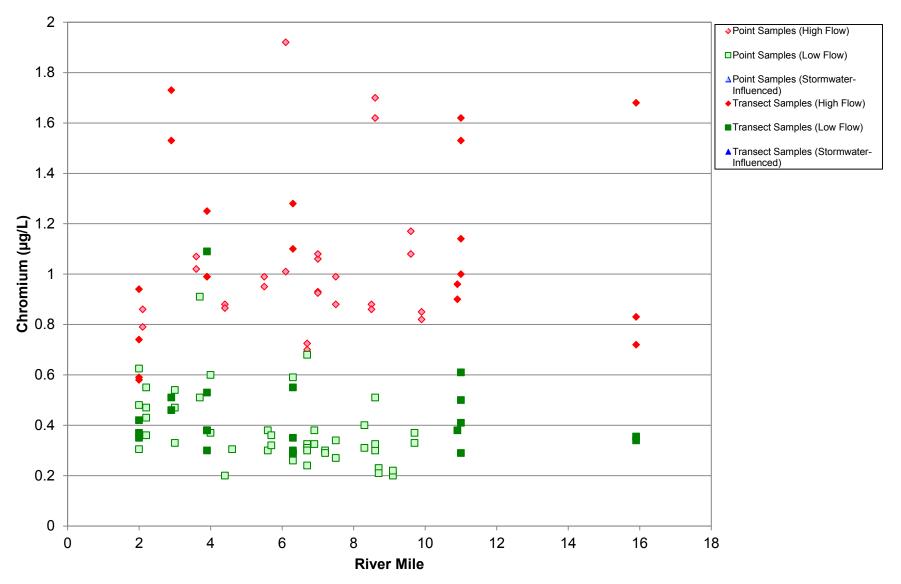
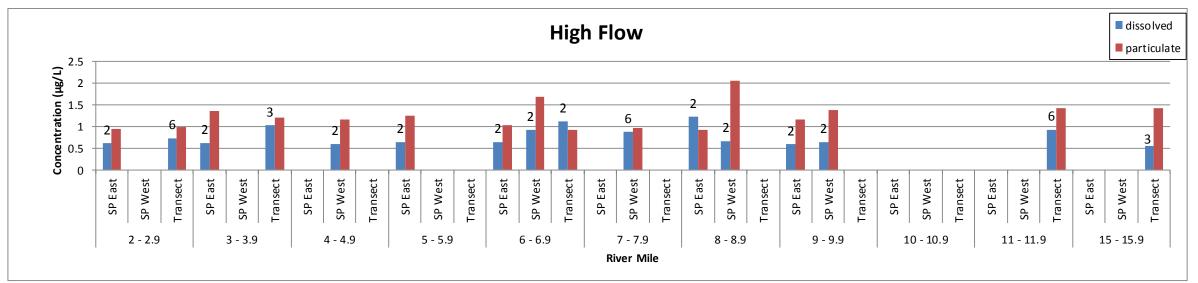
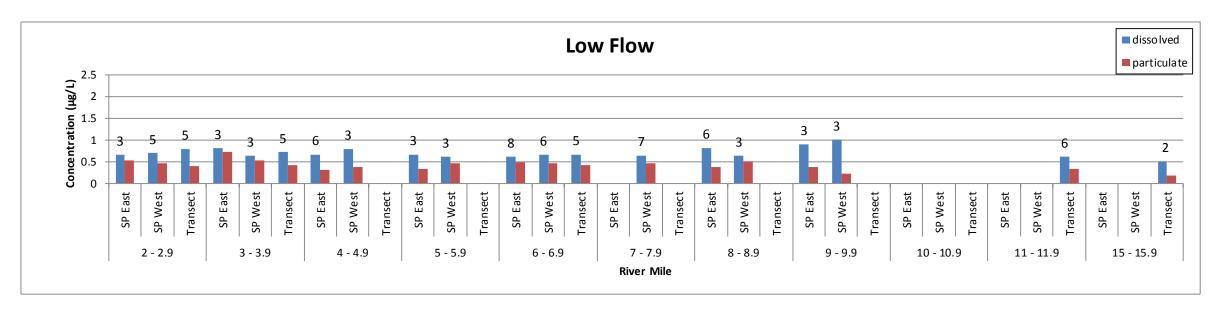
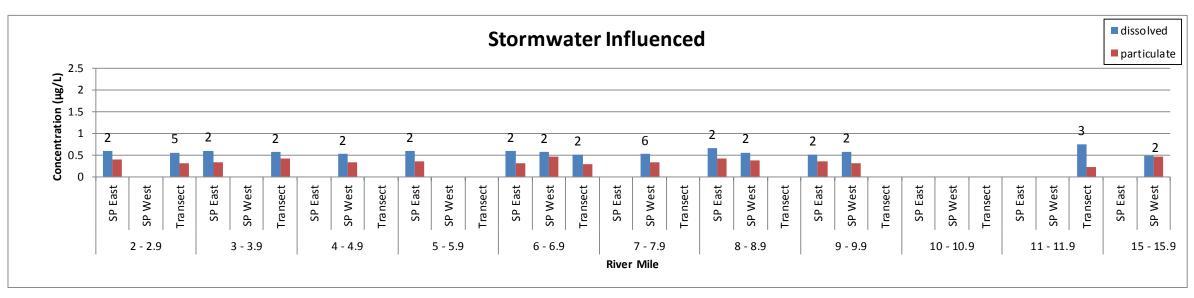


Figure 5.4-51
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Chromium Concentrations in
Surface Water by River Mile (RM 2-16)







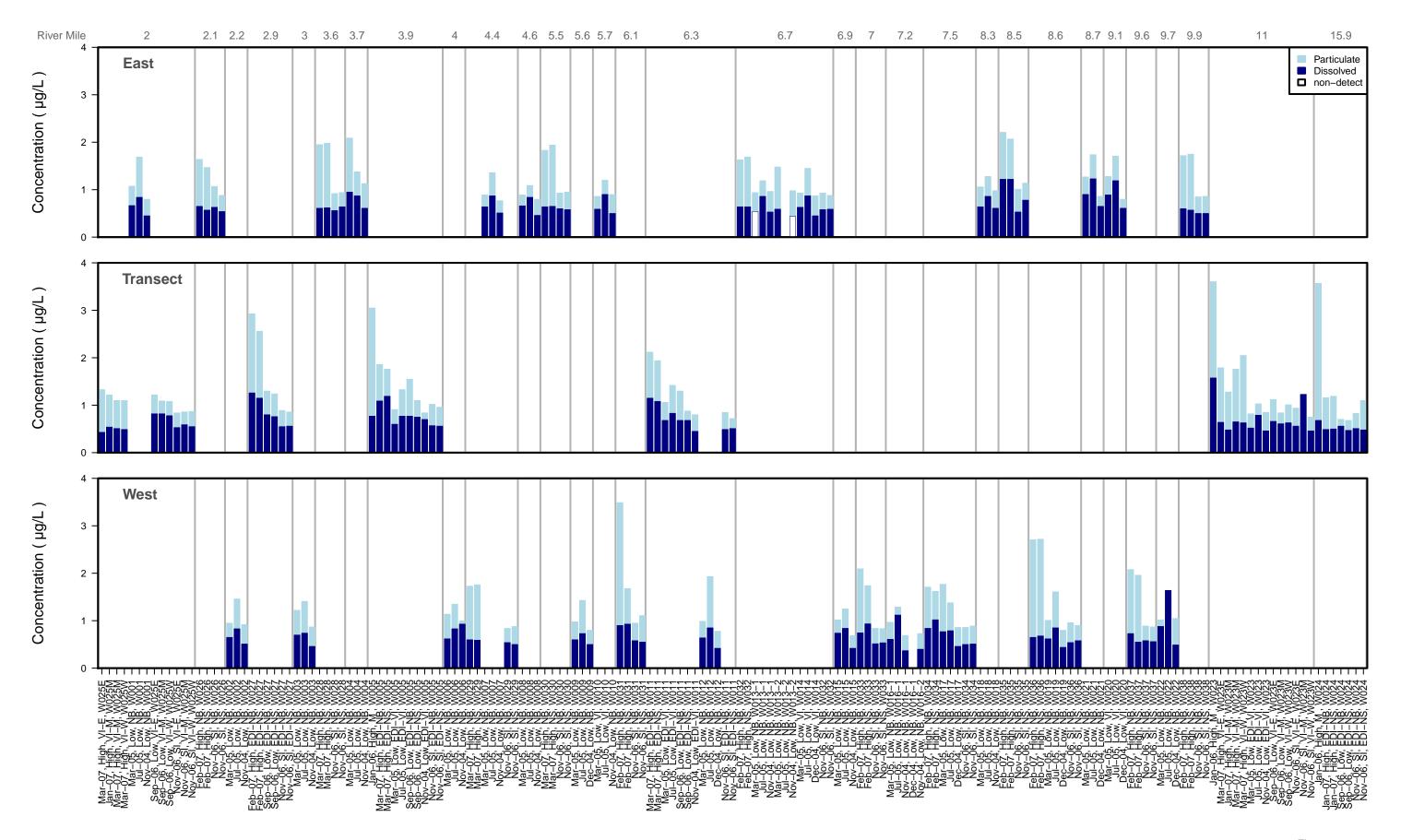


Figure 5.4–53
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Copper Concentrations in Surface Water, RM 2–16

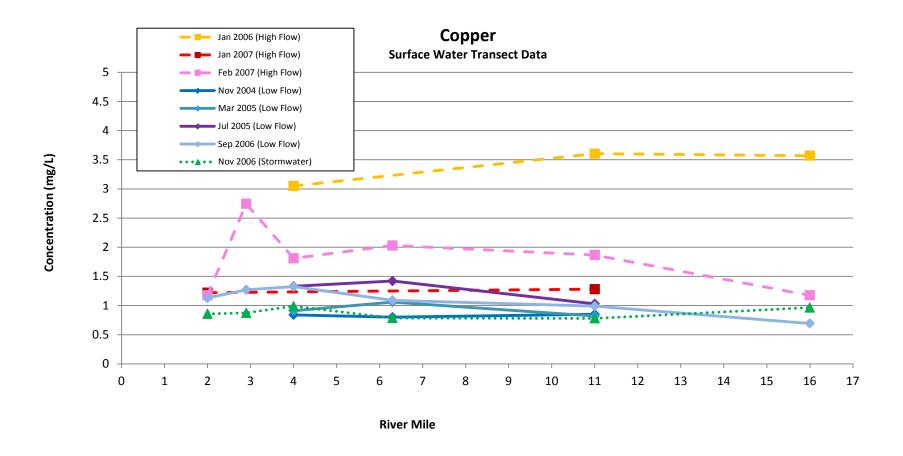


Figure 5.4-54
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Copper Concentrations in
Surface Water by River Mile (RM 2–16)

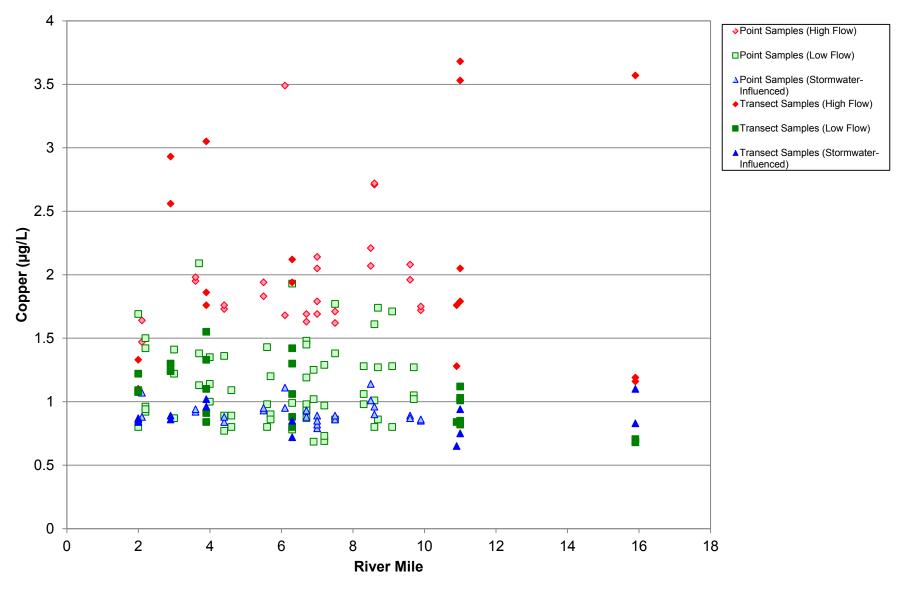
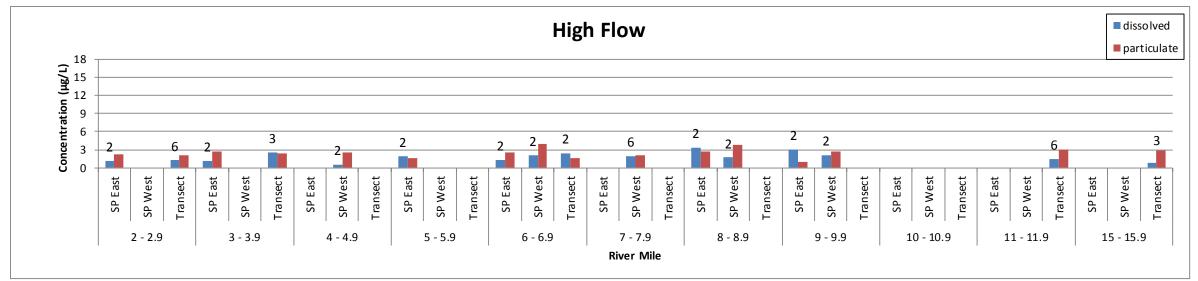
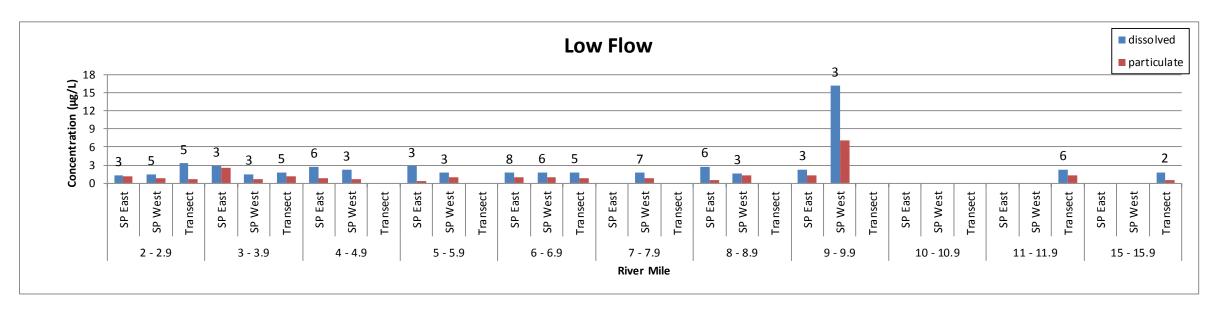
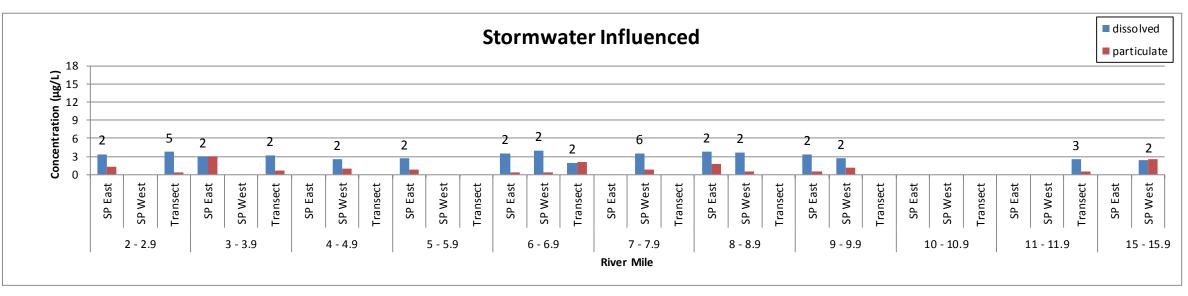


Figure 5.4-55
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Copper Concentrations in
Surface Water by River Mile (RM 2-16)







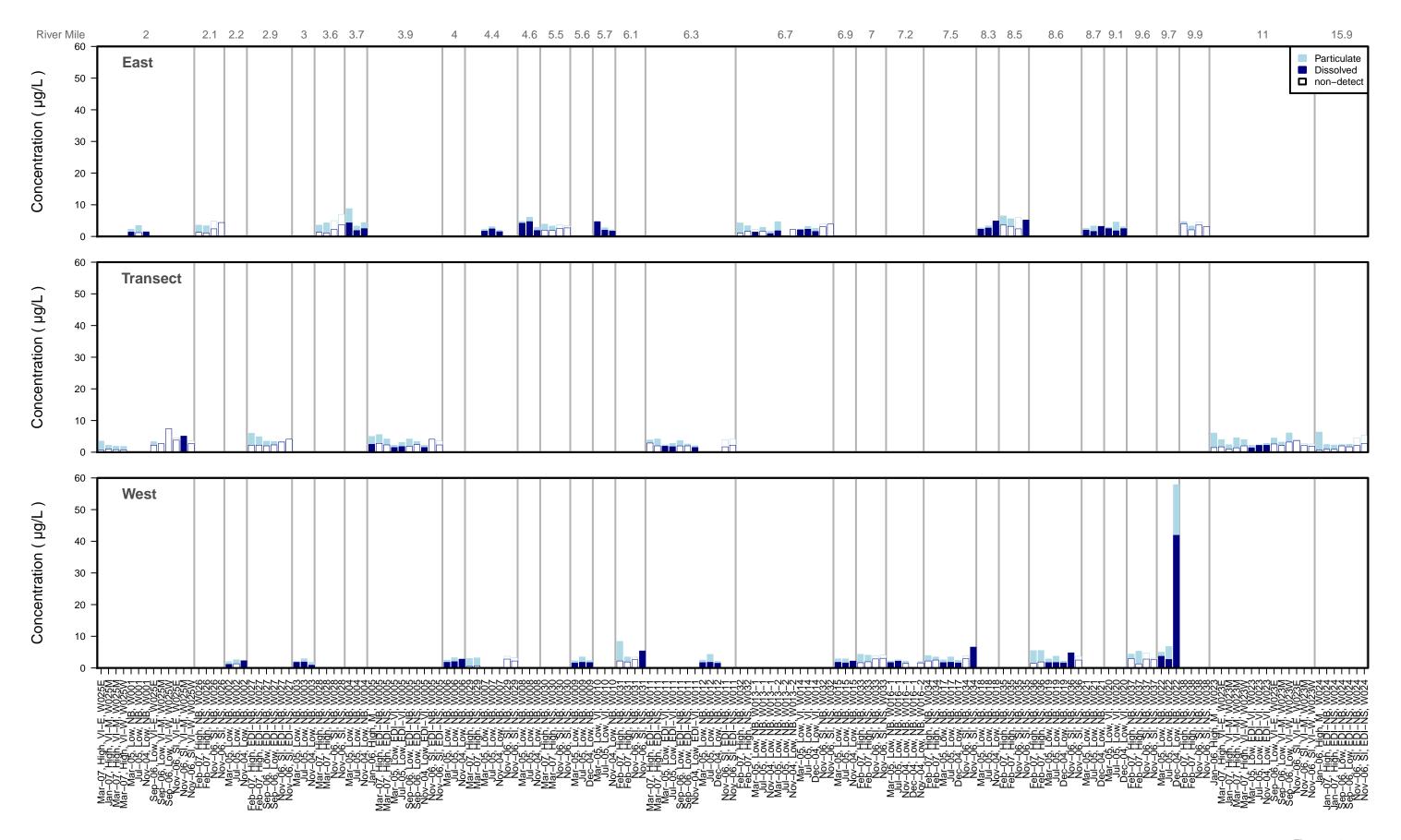


Figure 5.4–57a
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Zinc Concentrations in Surface Water, RM 2–16

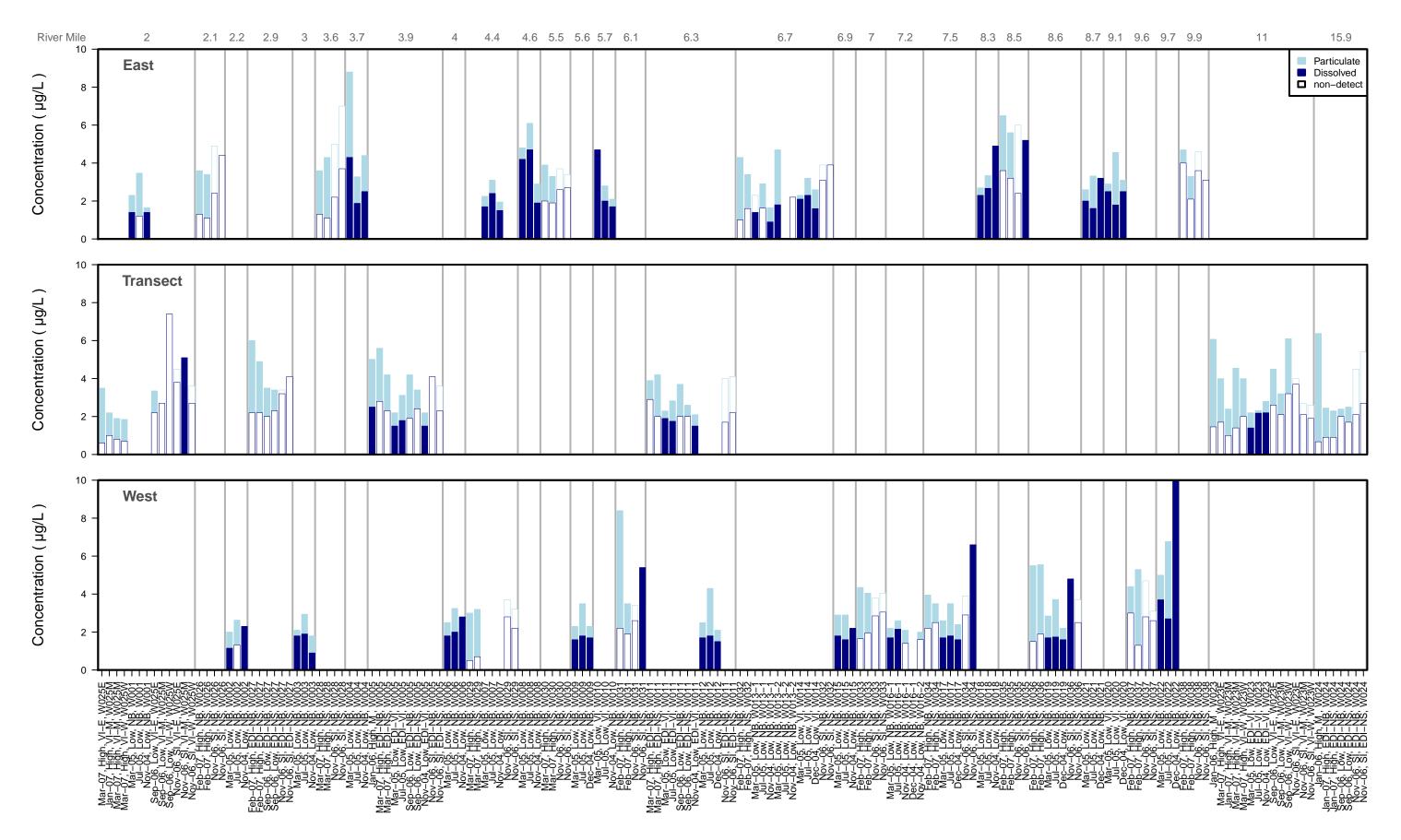


Figure 5.4– 57b
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Zinc Concentrations in Surface Water, RM 2–16 (Scale Zoomed)

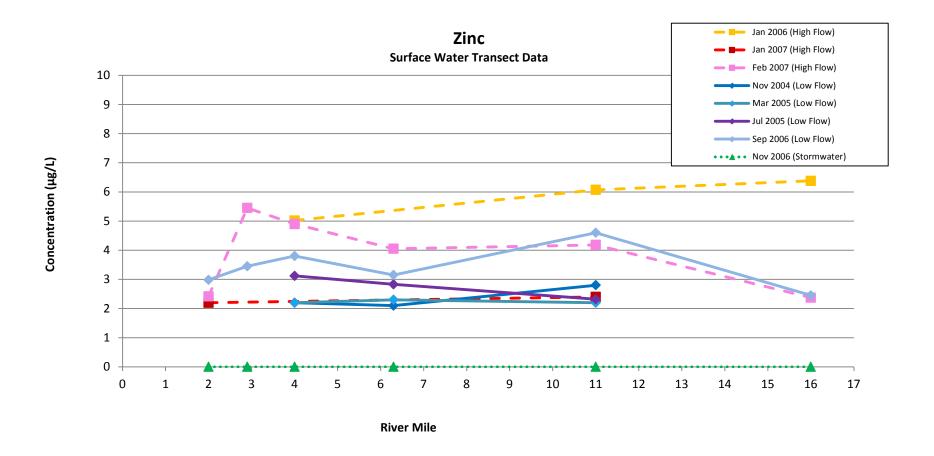


Figure 5.4-58
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect Zinc Concentrations in
Surface Water by River Mile (RM 2–16)

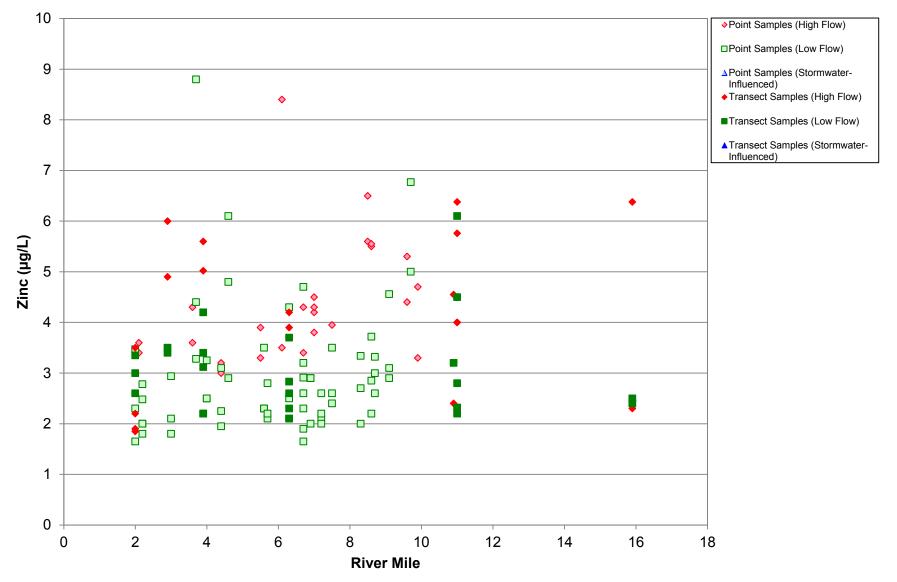
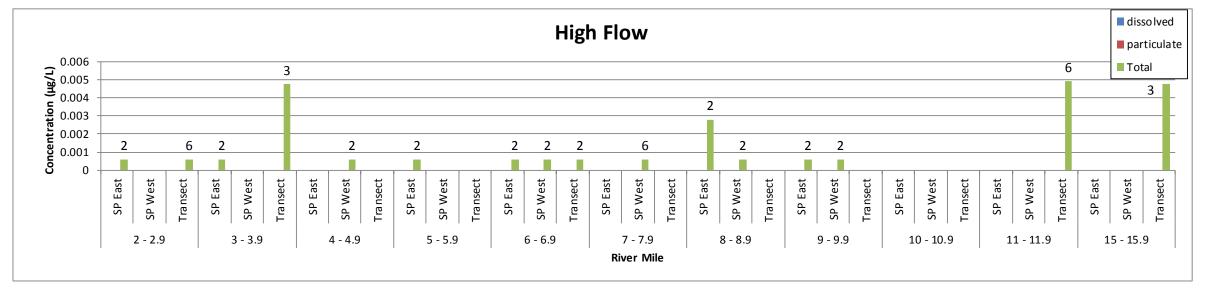
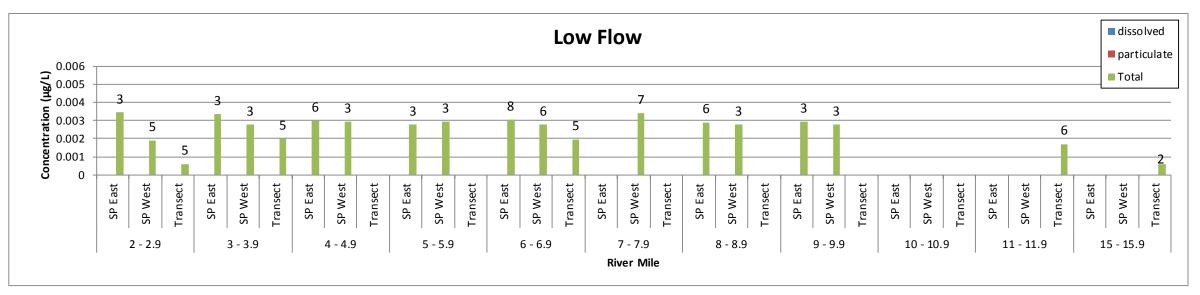
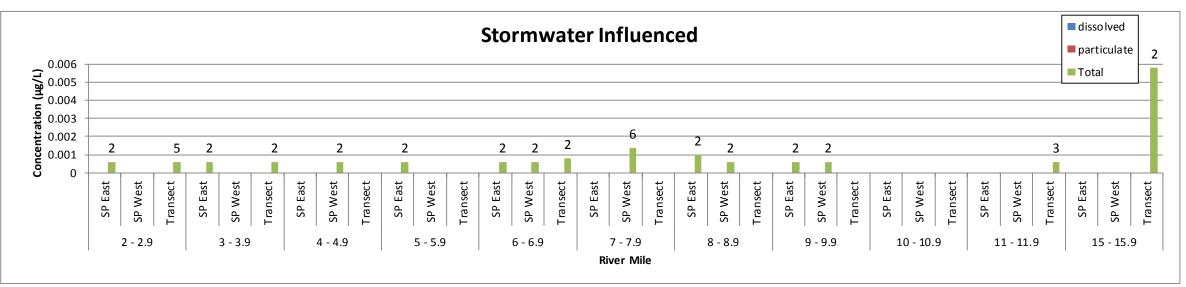


Figure 5.4-59
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected Zinc Concentrations in
Surface Water by River Mile (RM 2-16)







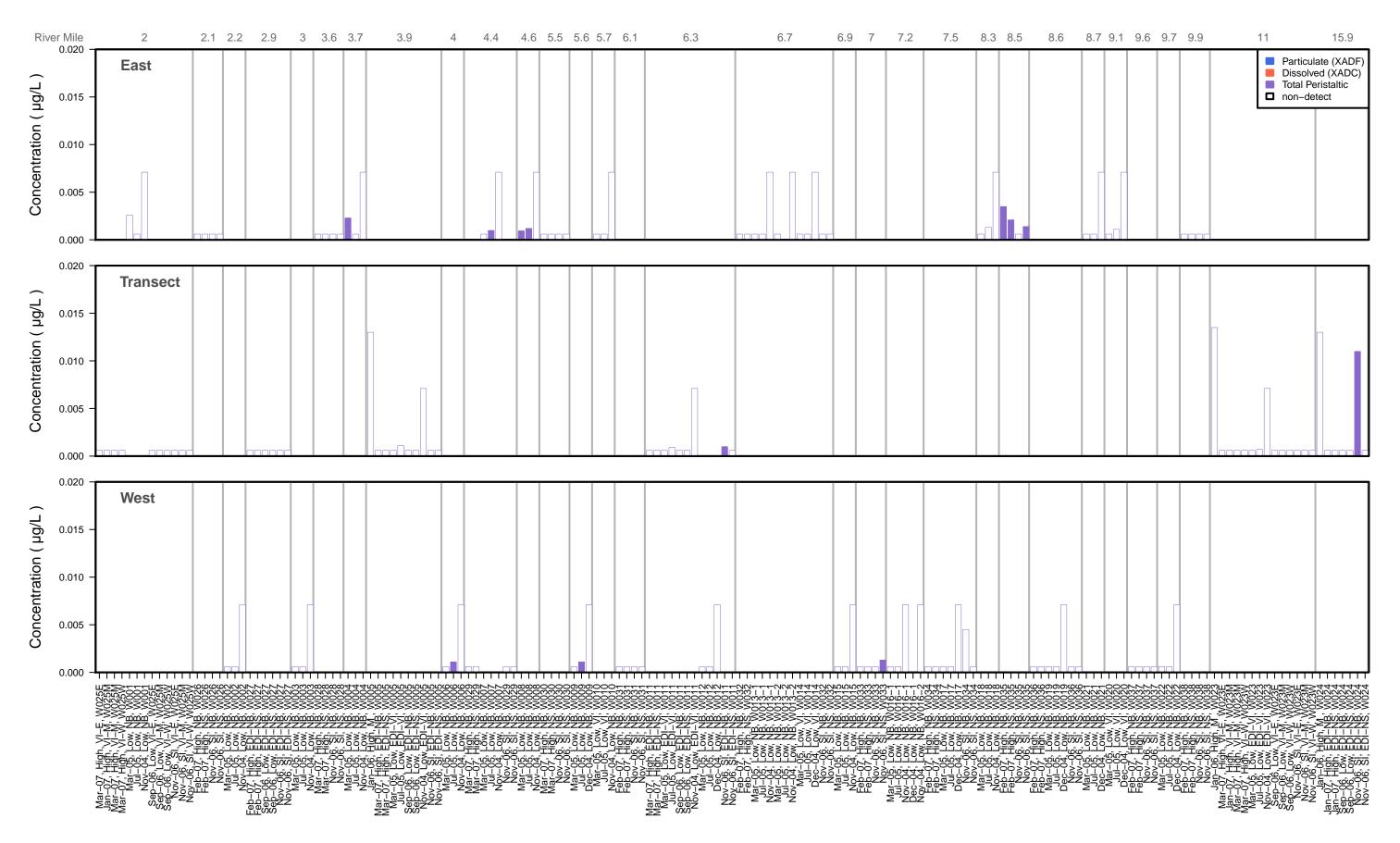


Figure 5.4–61
Portland Harbor RI/FS
Remedial Investigation Report
Histogram by Channel Position of Tributyltin Ion Concentrations in Surface Water, RM 2–16

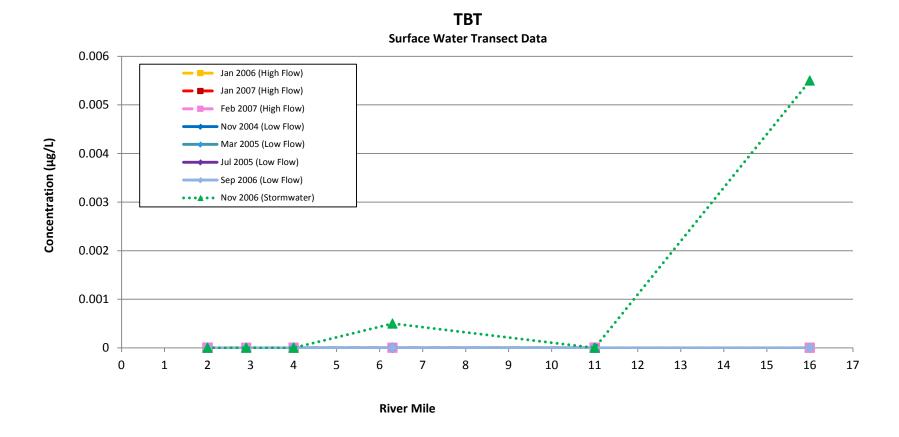


Figure 5.4-62
Portland Harbor RI/FS
Remedial Investigation Report
Line Plot of Transect TBT Concentrations in
Surface Water by River Mile (RM 2–16)

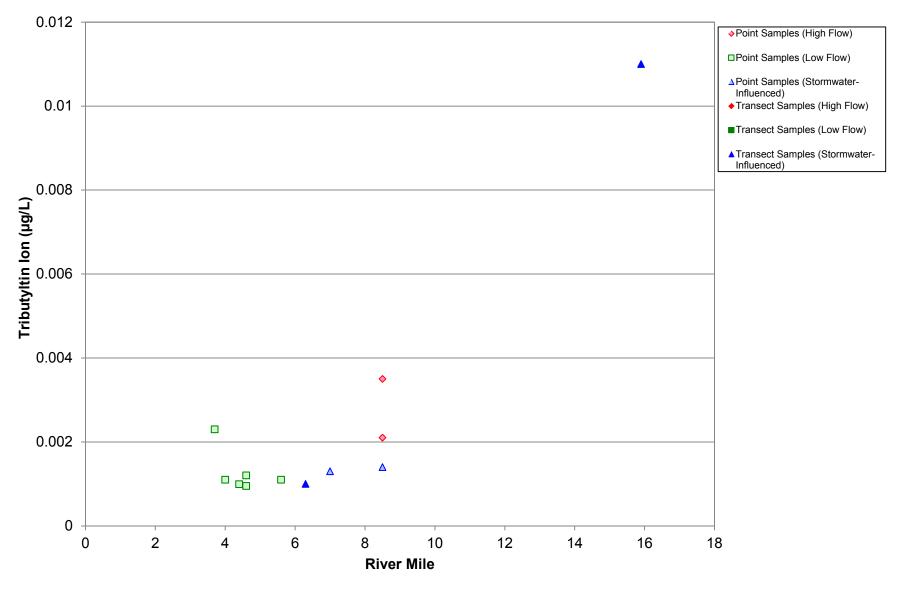


Figure 5.4-63
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Detected TBT Concentrations in
Surface Water by River Mile (RM 2-16)

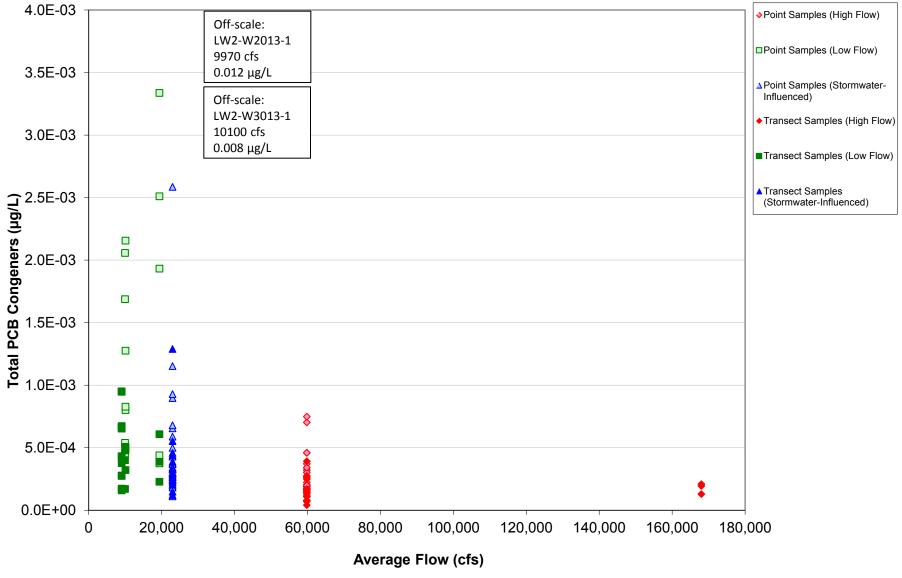


Figure 5.4-64
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Concentrations in
Surface Water vs. Flow Rate, RM 2–16 (XAD)

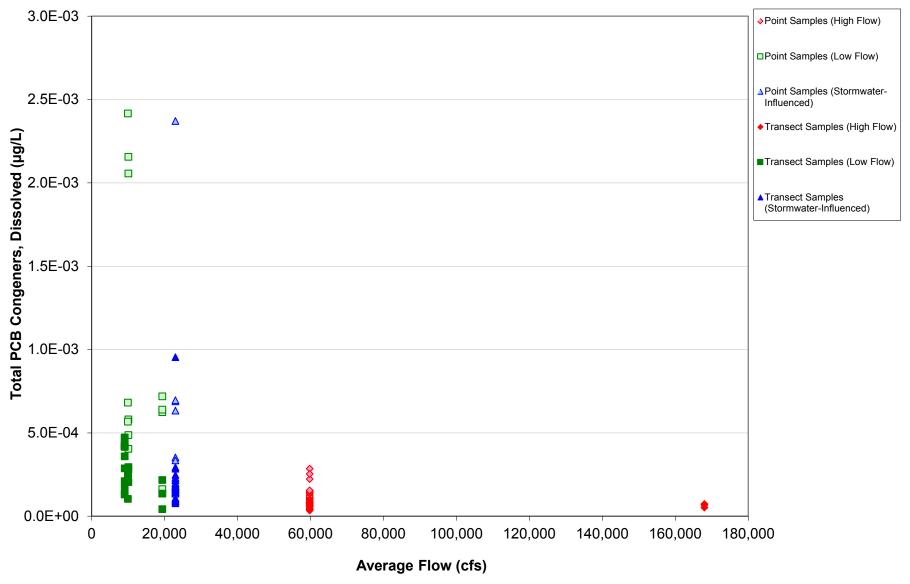


Figure 5.4-65
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Dissolved Concentrations in
Surface Water vs. Flow Rate, RM 2–16 (XAD)

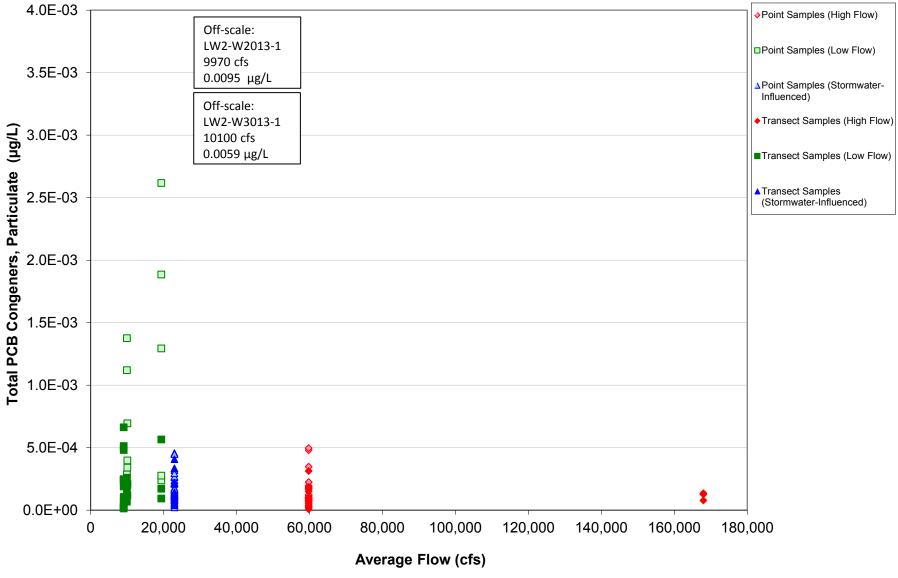


Figure 5.4-66
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Particulate Concentrations in
Surface Water vs. Flow Rate, RM 2–16 (XAD)

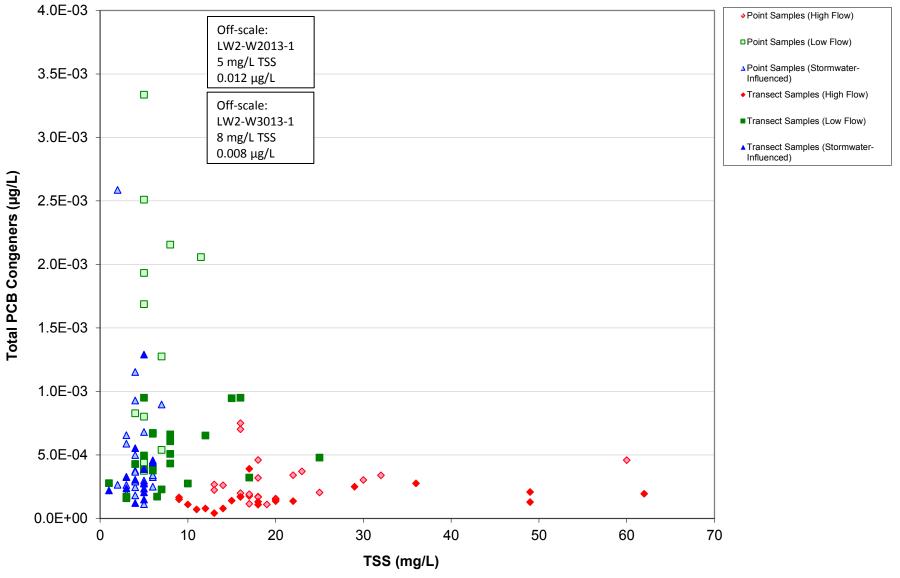


Figure 5.4-67
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Concentrations vs. Total
Suspended Solids Concentrations in Surface Water, RM 2–16 (XAD)

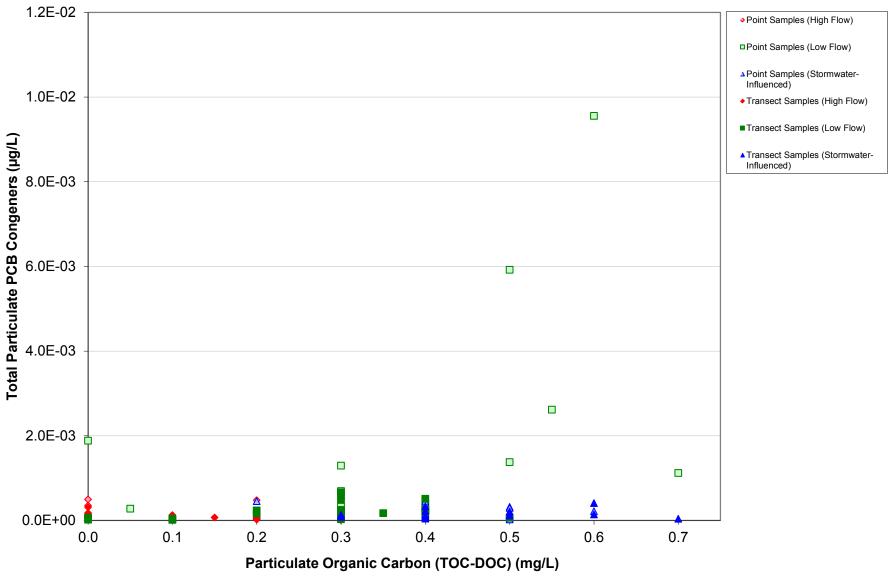


Figure 5.4-68a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Particulate
Concentrations vs. Particulate Organic Carbon
Concentrations in Surface Water, RM 2–16 (XAD)

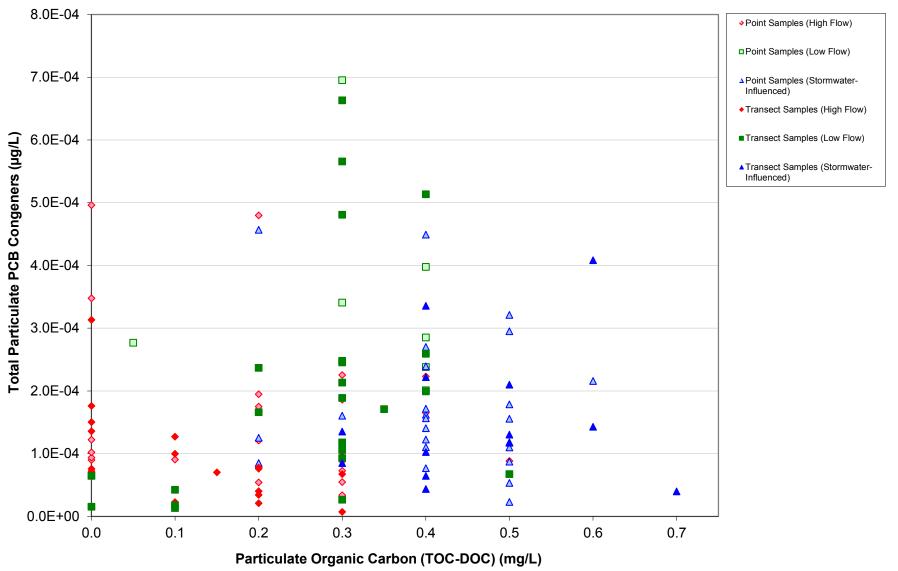


Figure 5.4-68b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCB Congener Particulate
Concentrations vs. Particulate Organic Carbon
Concentrations in Surface Water, RM 2–16 (XAD), Scale Zoom

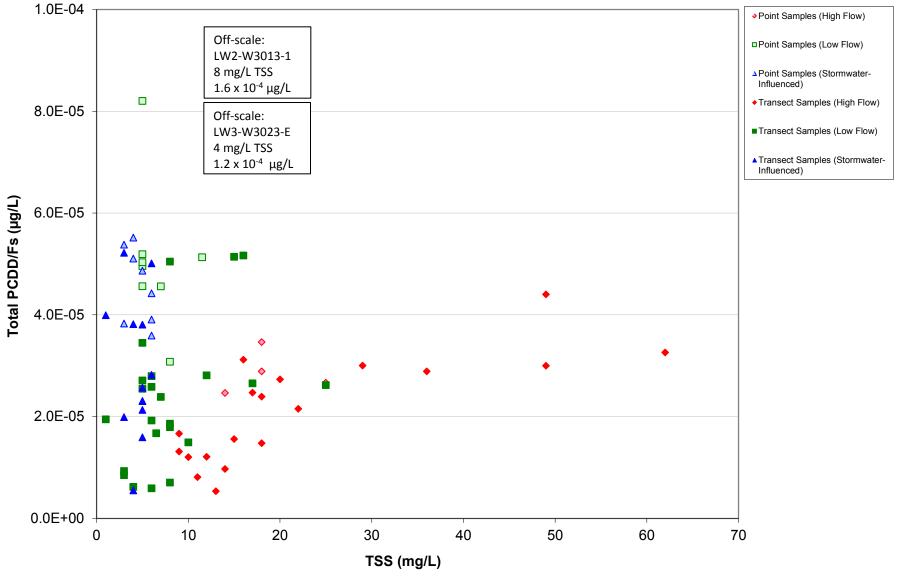


Figure 5.4-69
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCDD/Fs Concentrations vs. Total Suspended
Solids Concentrations in Surface Water, RM 2–16 (XAD)

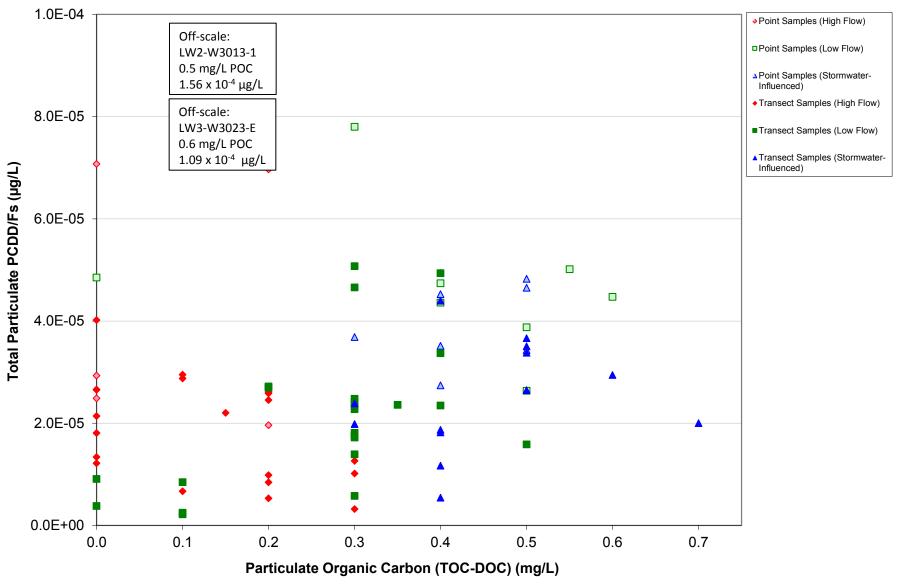


Figure 5.4-70
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PCDD/F Particulate Concentrations vs. Particulate
Organic Carbon Concentrations in Surface Water, RM 2-16 (XAD)

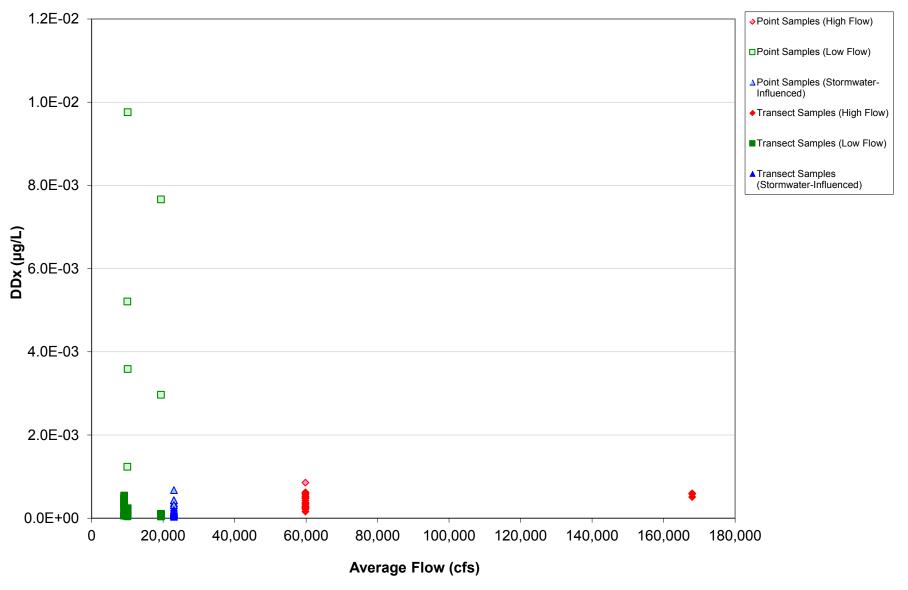


Figure 5.4-71a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Concentrations in Surface Water vs.
Flow Rate, RM 2–16 (XAD)

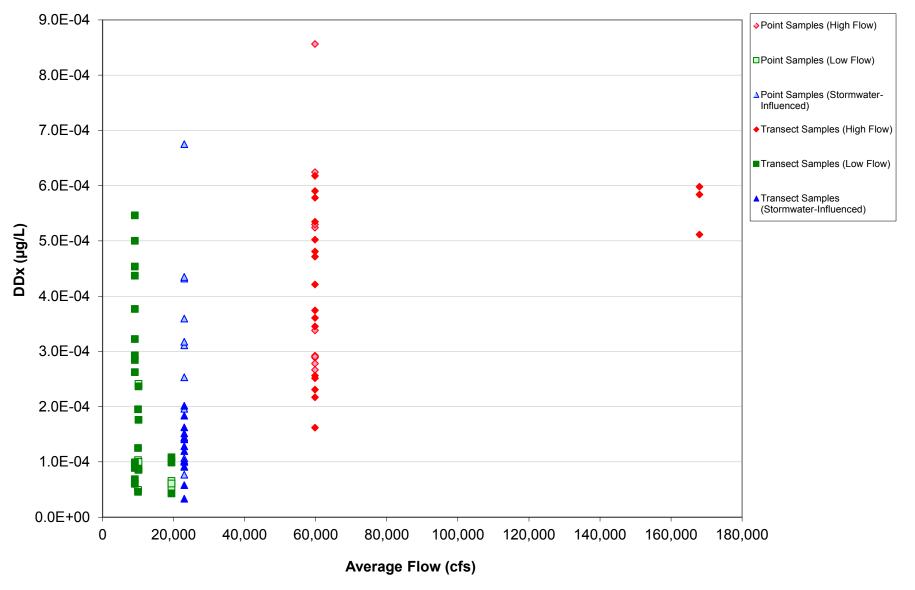


Figure 5.4-71b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Concentrations in Surface Water vs.
Flow Rate, RM 2–16 (XAD), Scale Zoom

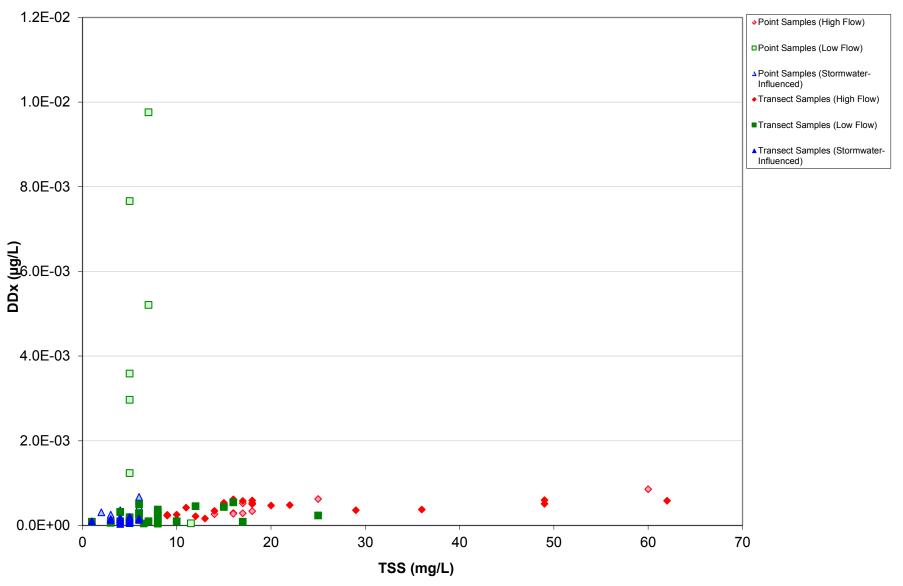


Figure 5.4-72a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Concentrations vs. Total Suspended
Solids Concentrations in Surface Water, RM 2–16 (XAD)

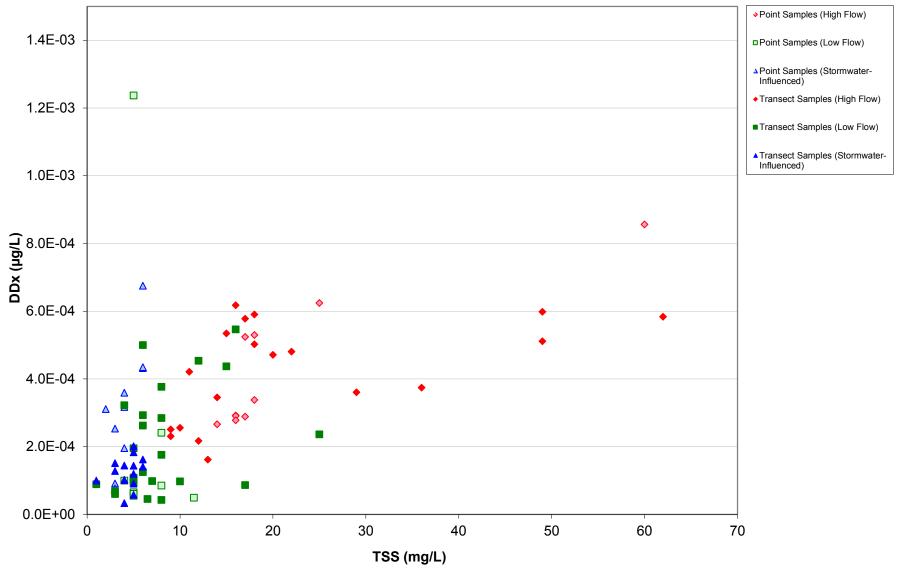


Figure 5.4-72b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Concentrations vs. Total Suspended Solids
Concentrations in Surface Water, RM 2–16 (XAD), Scale Zoom

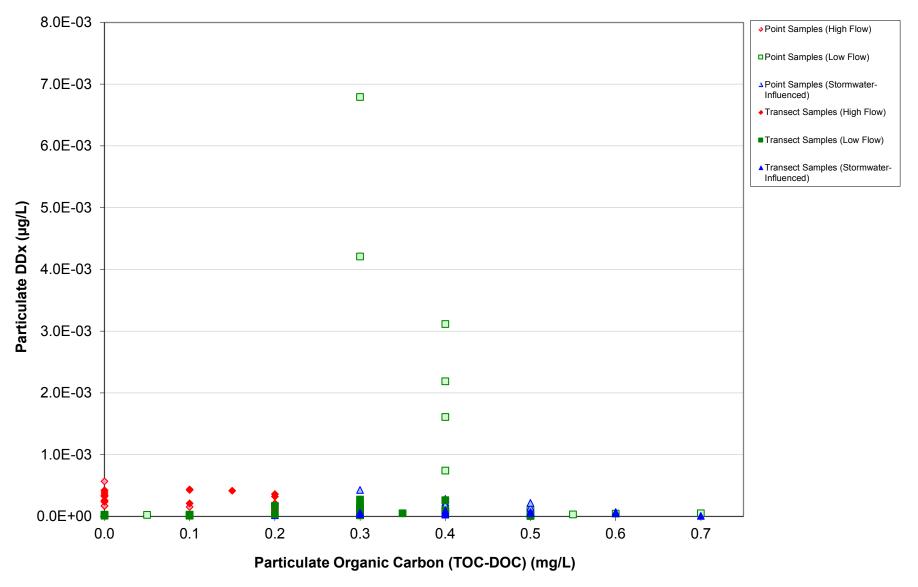


Figure 5.4-73a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Particulate Concentrations vs. Particulate
Organic Carbon Concentrations in Surface Water, RM 2–16 (XAD)

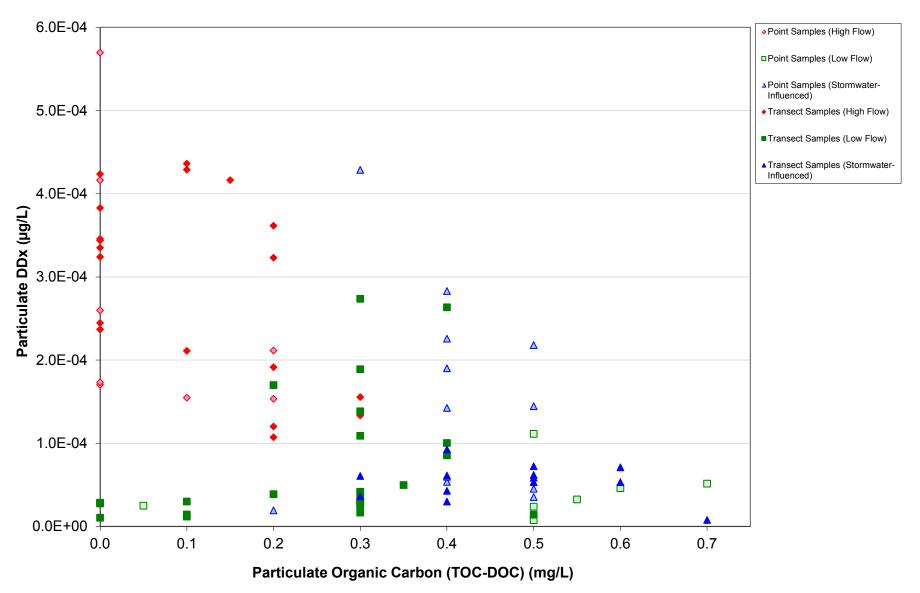


Figure 5.4-73b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of DDx Particulate Concentrations vs. Particulate Organic
Carbon Concentrations in Surface Water, RM 2–16 (XAD), Scale Zoom

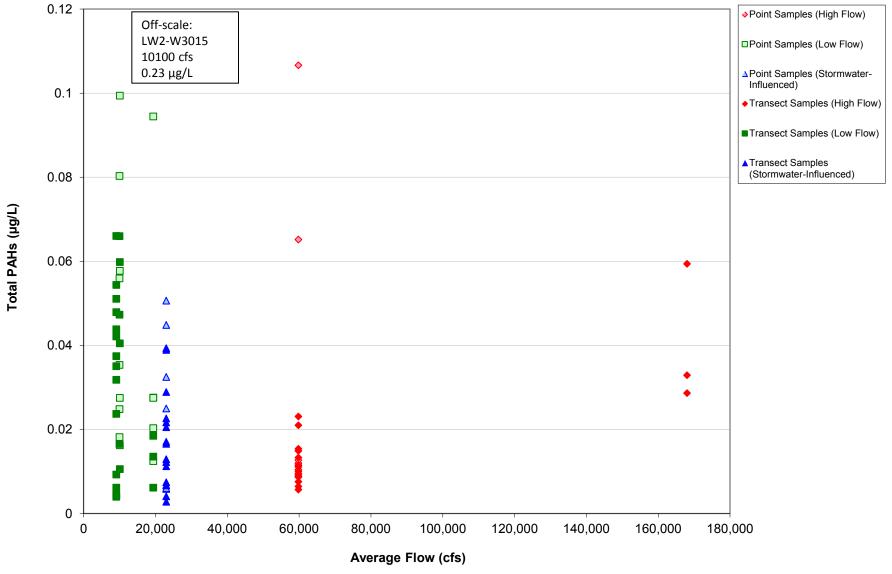


Figure 5.4-74
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PAHs Concentrations in Surface Water vs.
Flow Rate, RM 2–16 (XAD)

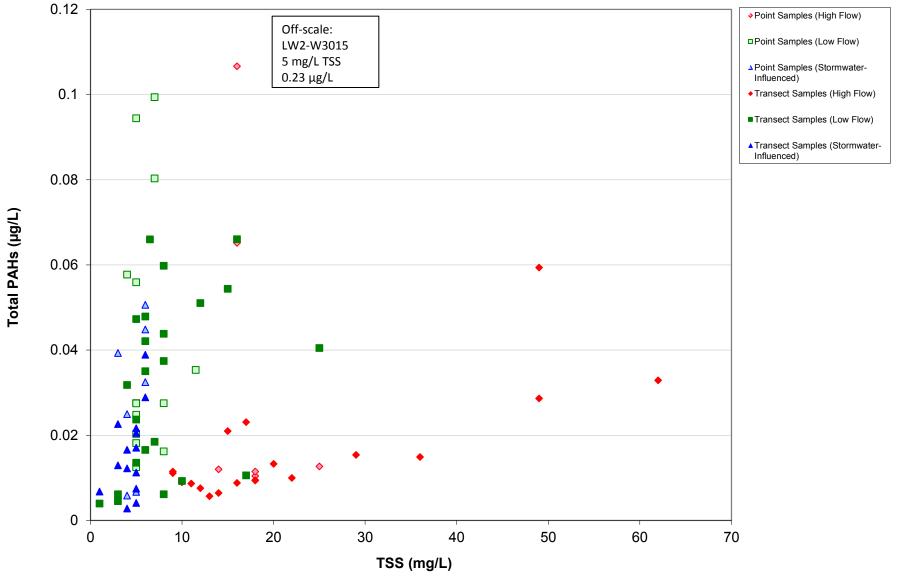


Figure 5.4-75
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PAHs Concentrations vs. Total Suspended
Solids Concentrations in Surface Water, RM 2–16 (XAD)

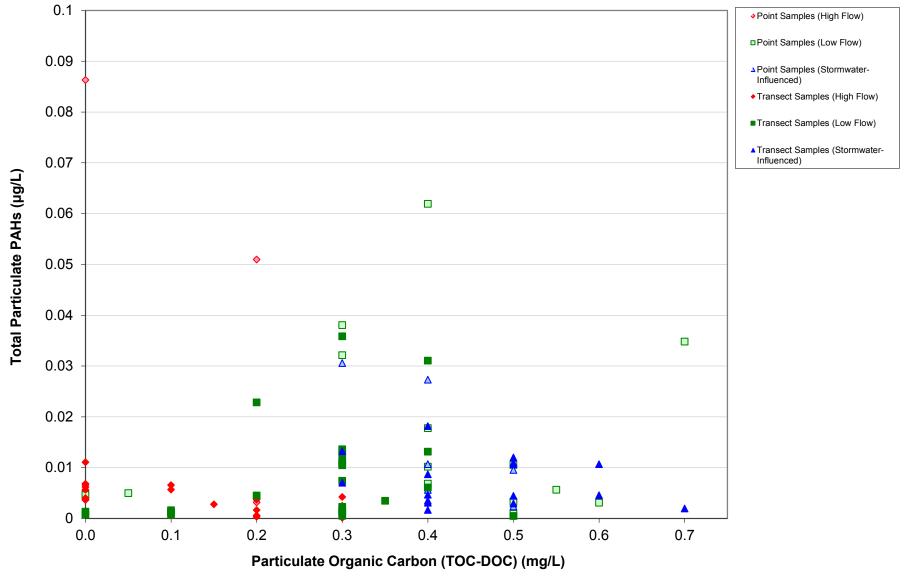


Figure 5.4-76
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Total PAH Particulate Concentrations vs. Particulate
Organic Carbon Concentrations in Surface Water, RM 2–16 (XAD)

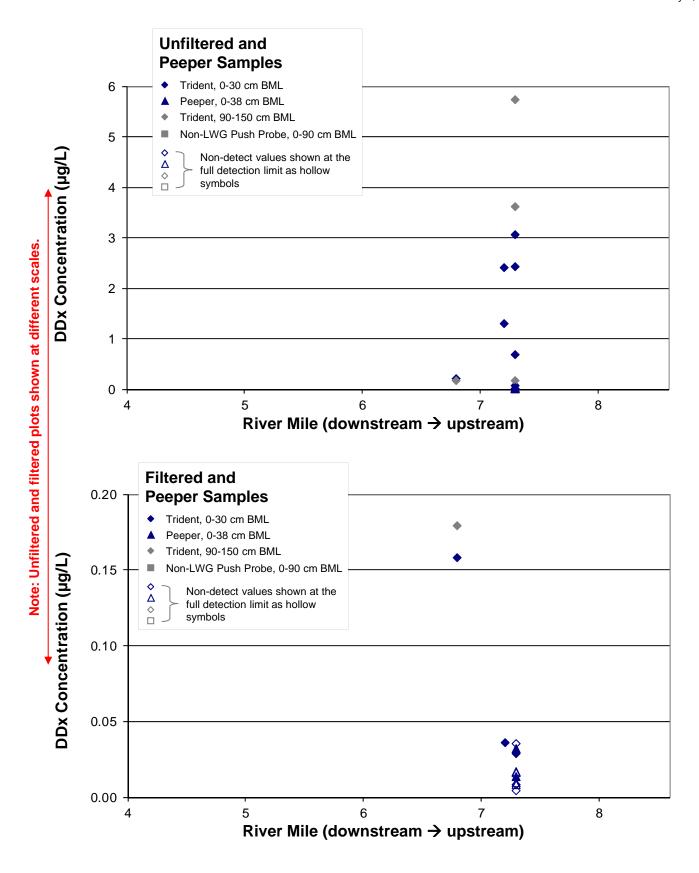


Figure 5.5-1a
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of DDx Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples

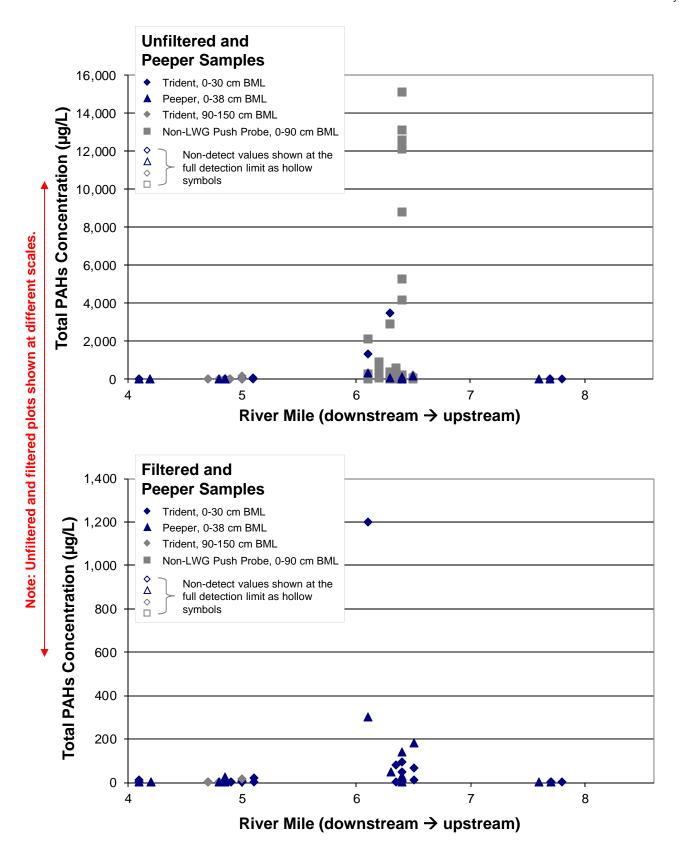


Figure 5.5-1b
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Total PAHs Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples

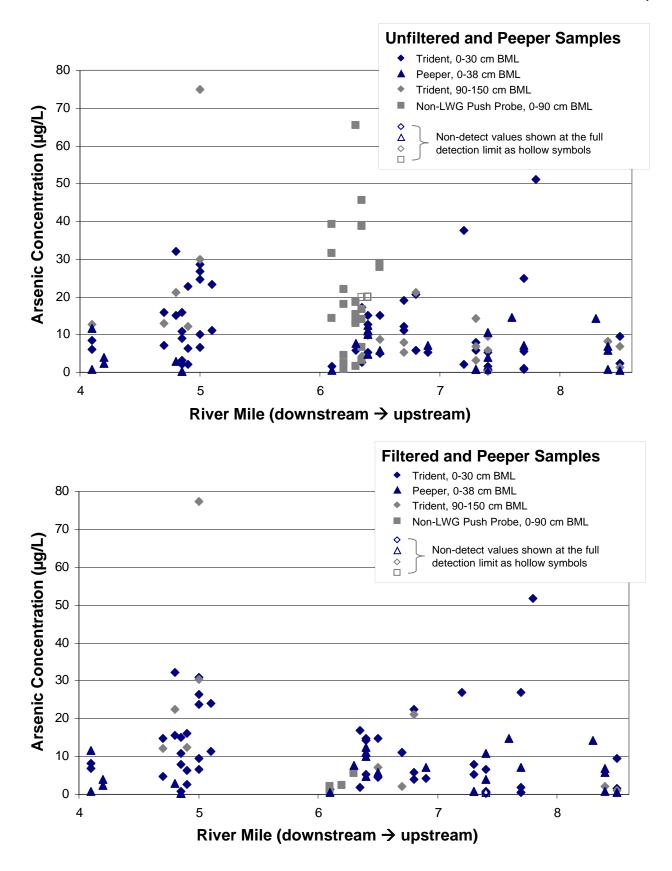
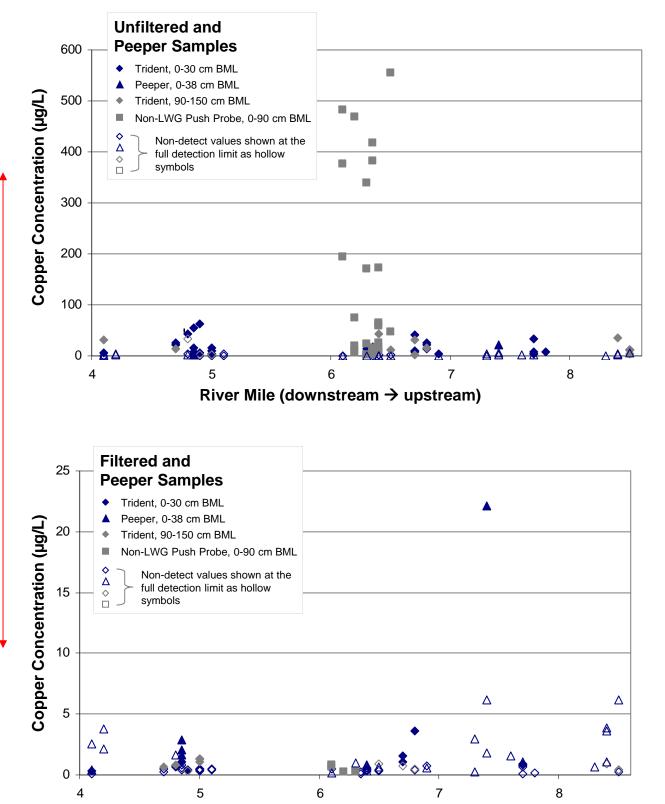


Figure 5.5-1c
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Arsenic Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples

Figure 5.5-1d
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Chromium Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples



River Mile (downstream → upstream)

Figure 5.5-1e
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Copper Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples

Figure 5.5-1f
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plots of Zinc Concentrations in Transition
Zone Water, Filtered and Unfiltered Peeper Samples

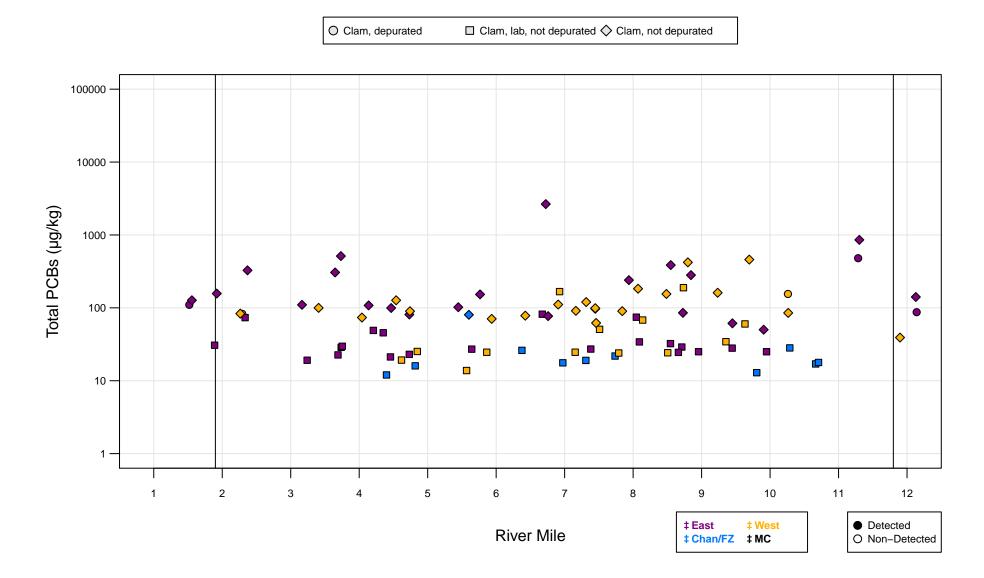
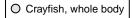


Figure 5.6-1a



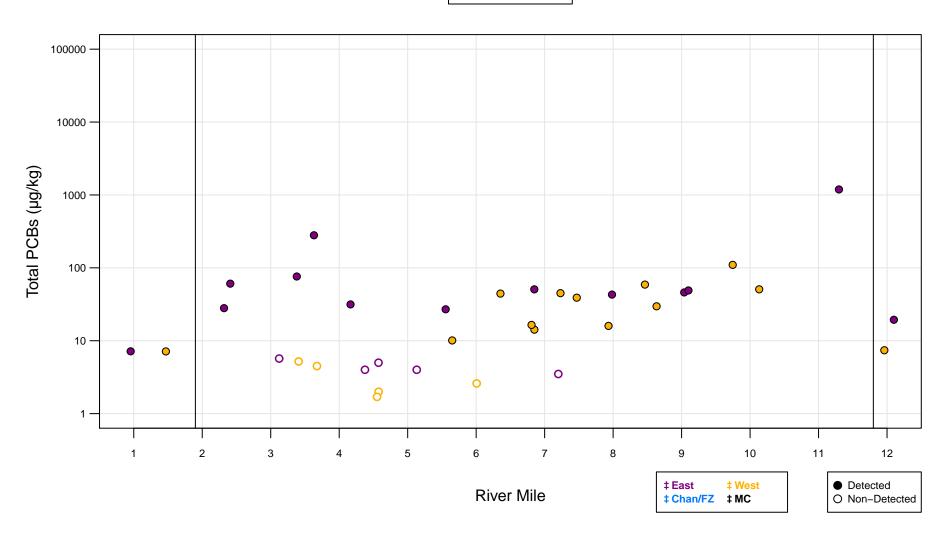


Figure 5.6-1b

O Sculpin, whole body

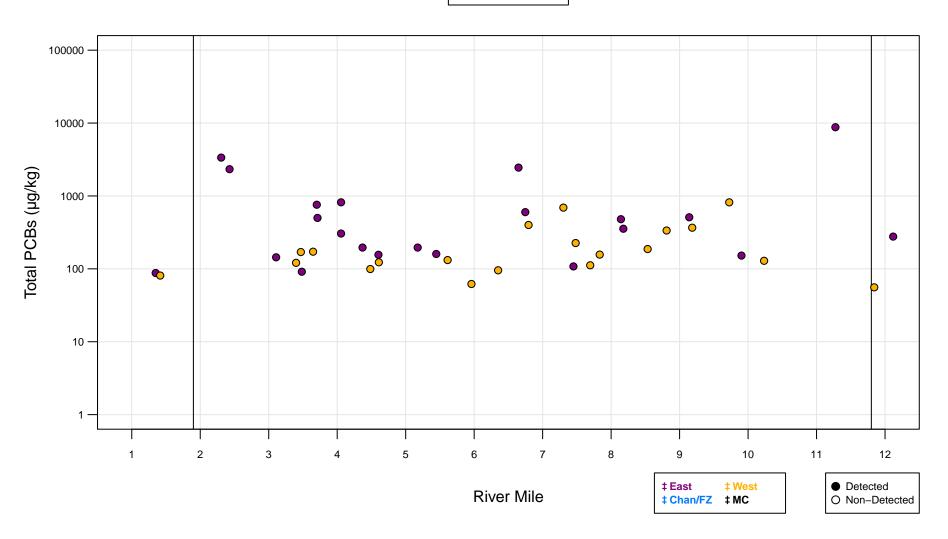


Figure 5.6-1c

O Smallmouth bass, whole body

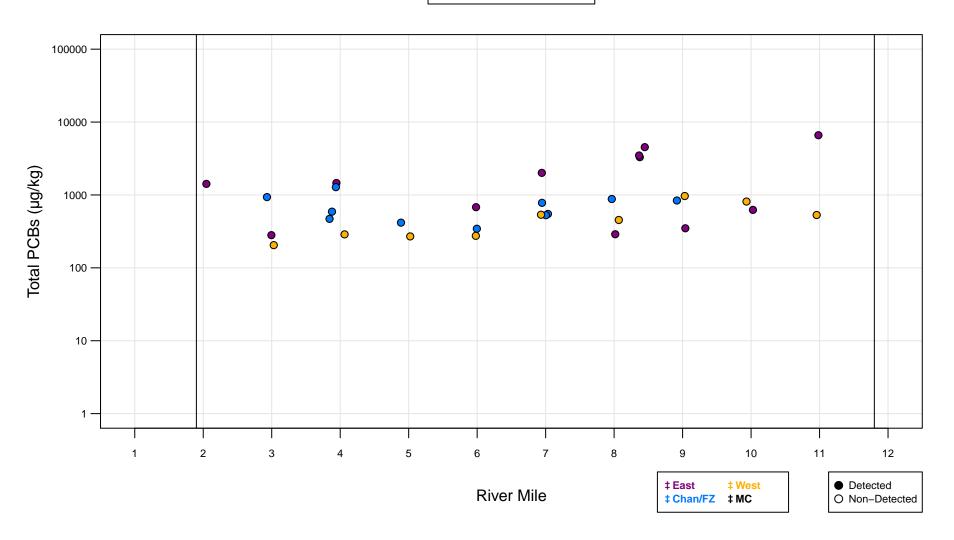


Figure 5.6-1d

O Lumbriculus, whole body

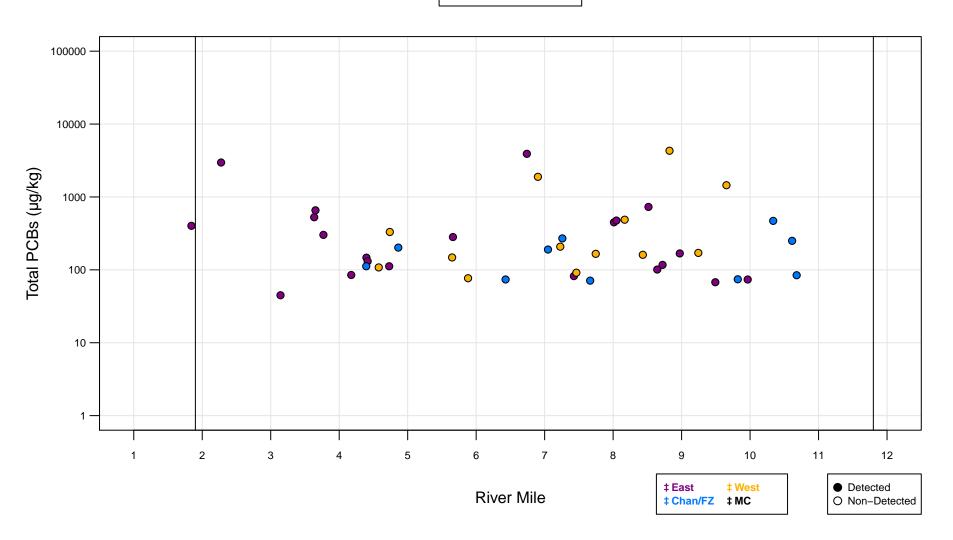


Figure 5.6-1e

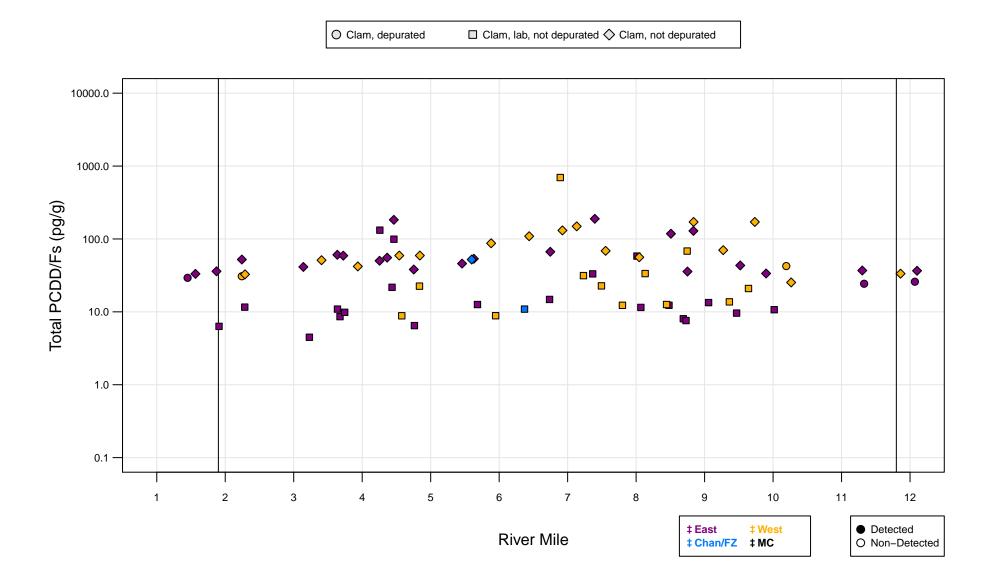
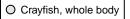


Figure 5.6-2a



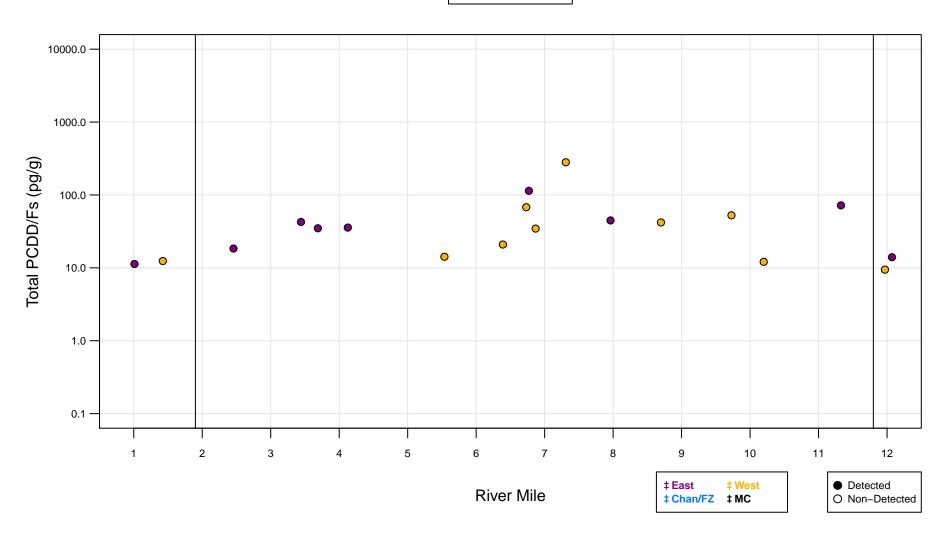


Figure 5.6-2b

O Sculpin, whole body

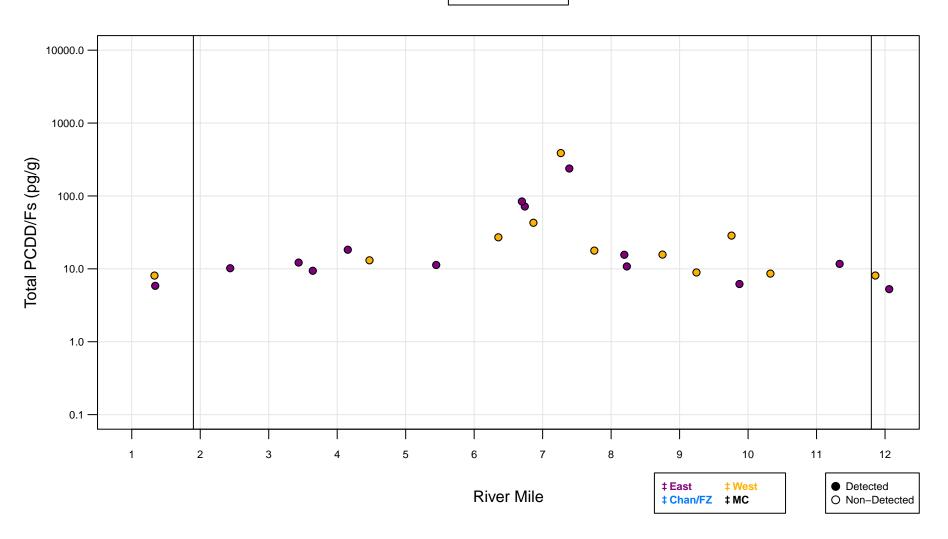


Figure 5.6-2c

O Smallmouth bass, whole body

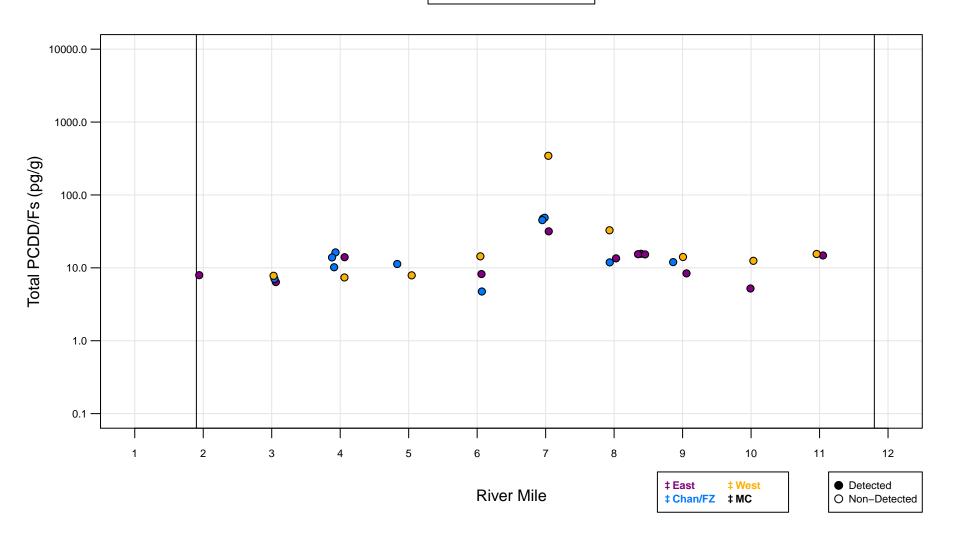


Figure 5.6-2d

O Lumbriculus, whole body

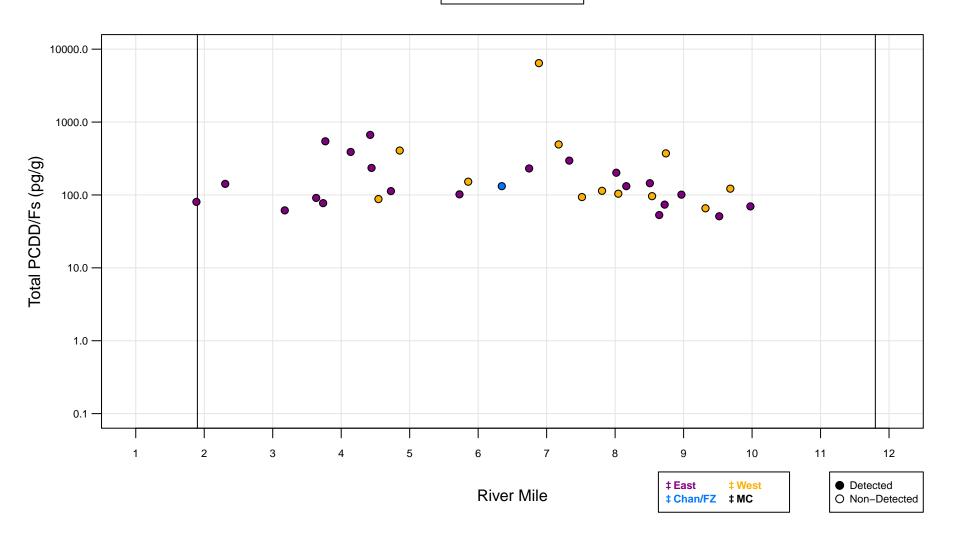


Figure 5.6-2e

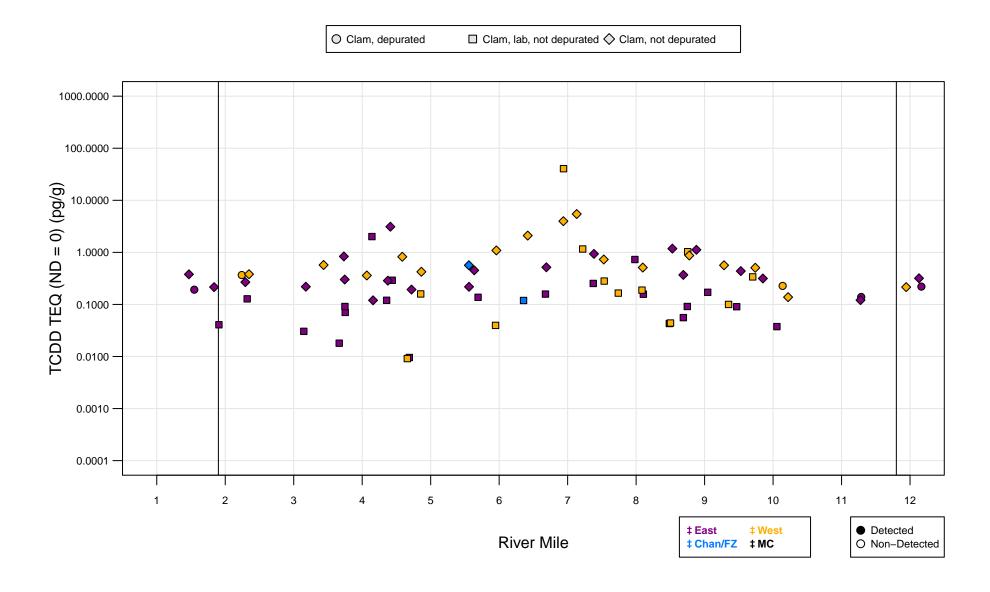


Figure 5.6–3a

O Crayfish, whole body

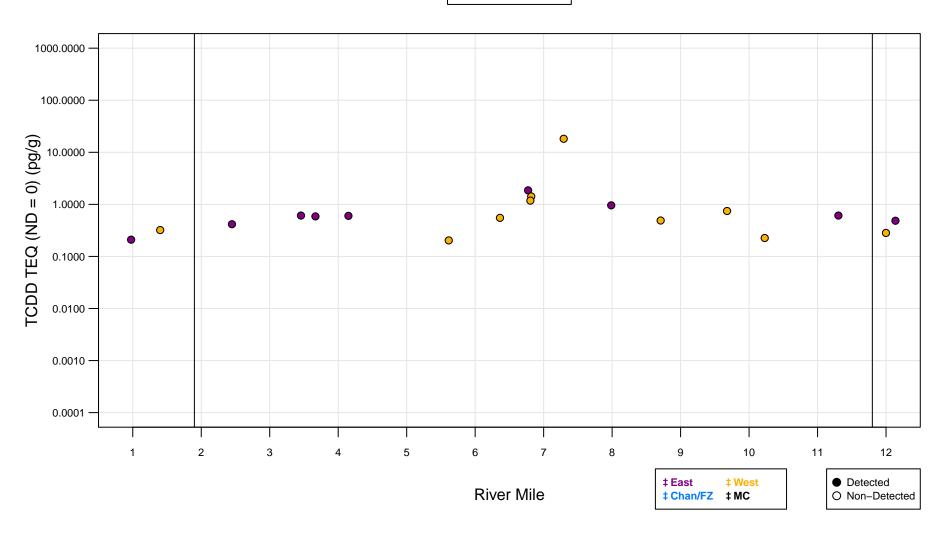


Figure 5.6-3b

O Sculpin, whole body

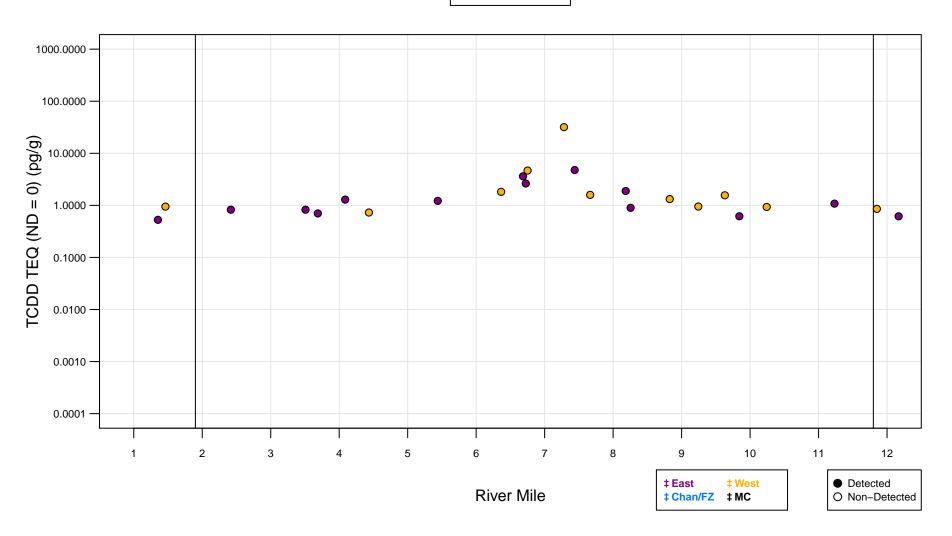


Figure 5.6-3c

O Smallmouth bass, whole body

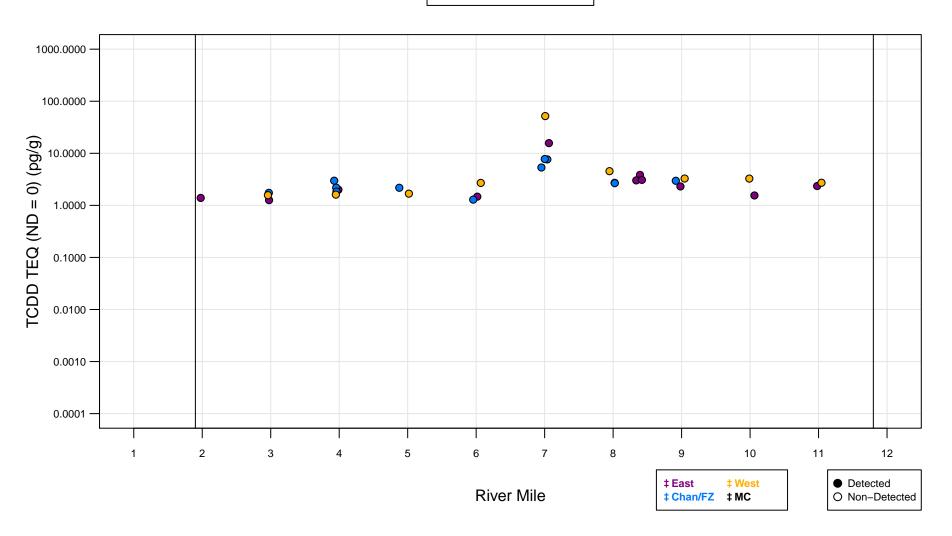


Figure 5.6-3d

O Lumbriculus, whole body

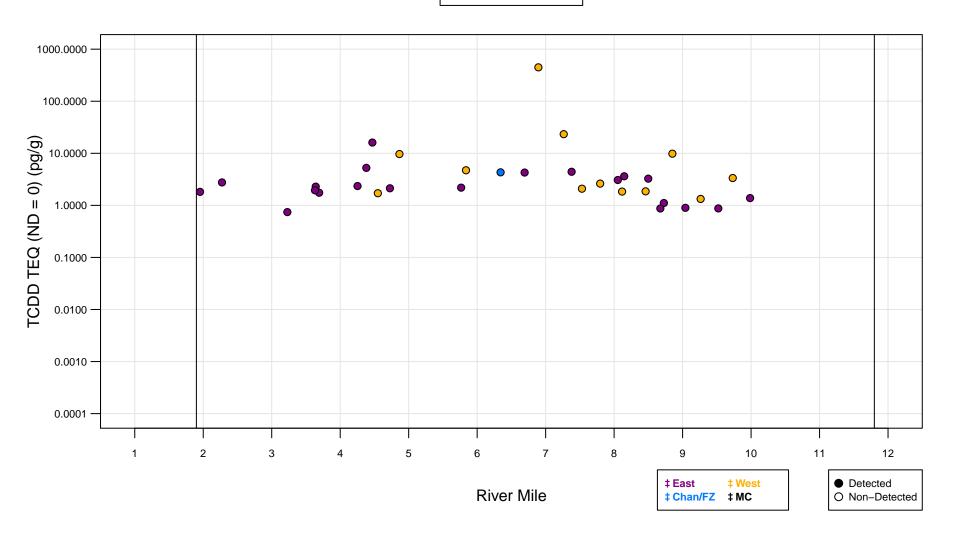


Figure 5.6-3e

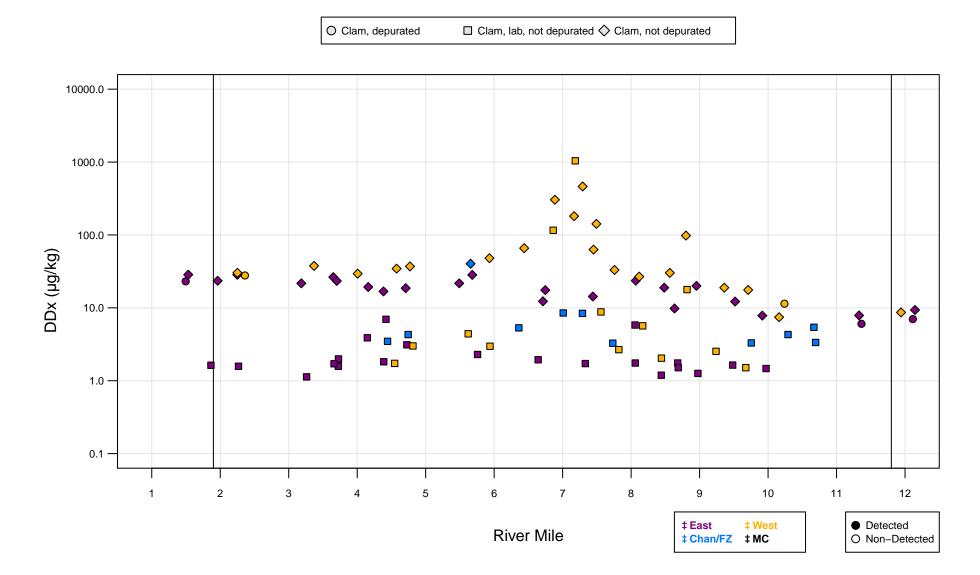


Figure 5.6-4a

O Crayfish, whole body

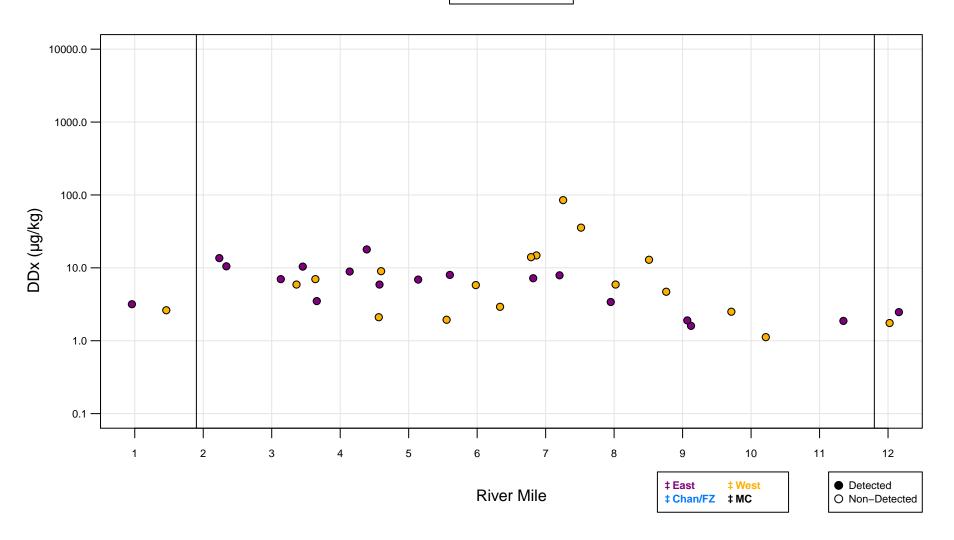


Figure 5.6-4b

O Sculpin, whole body

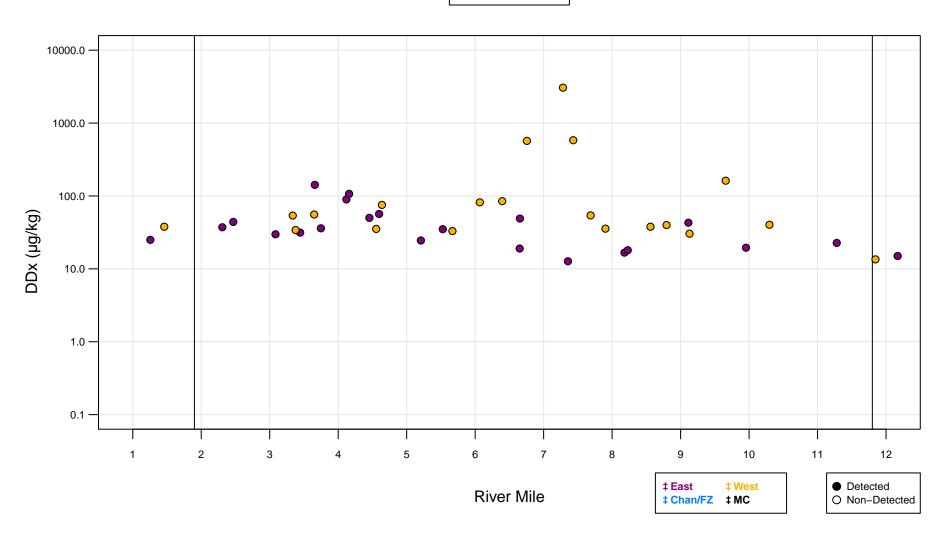


Figure 5.6-4c

O Smallmouth bass, whole body

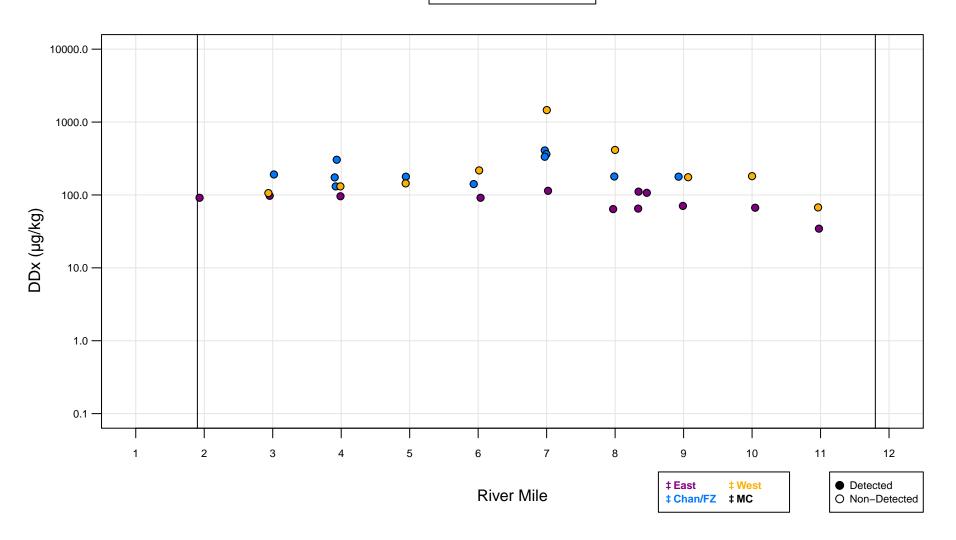


Figure 5.6-4d

O Lumbriculus, whole body

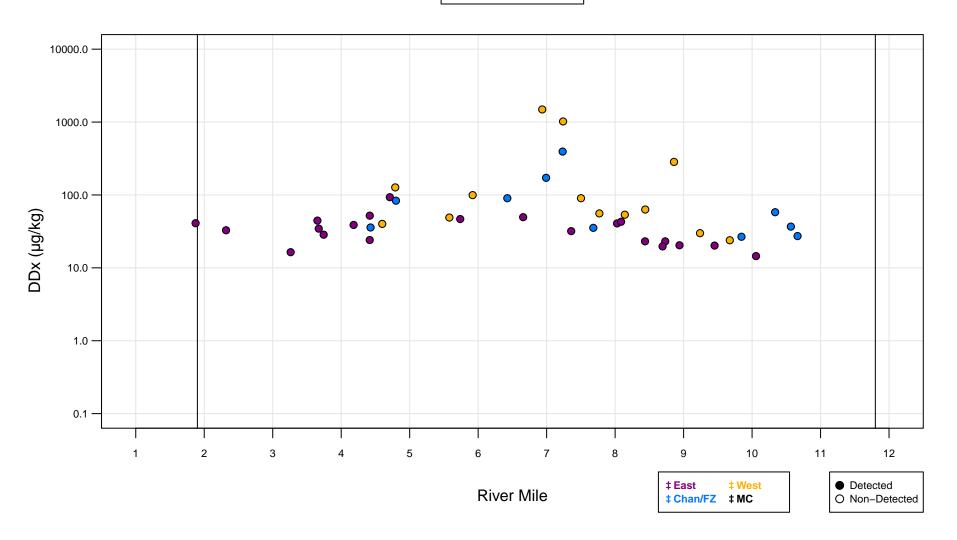
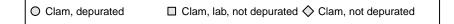


Figure 5.6-4e



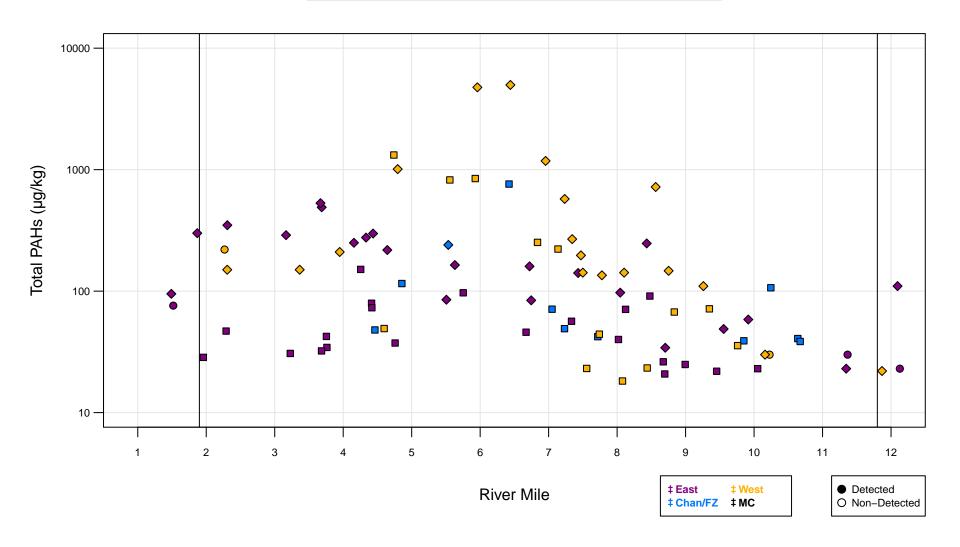


Figure 5.6-5

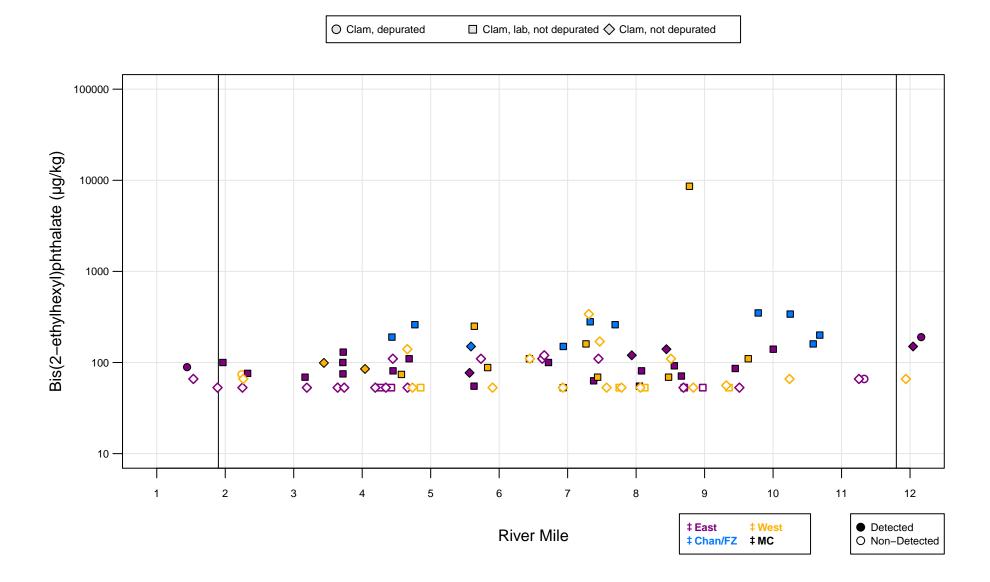


Figure 5.6–6a

O Crayfish, whole body

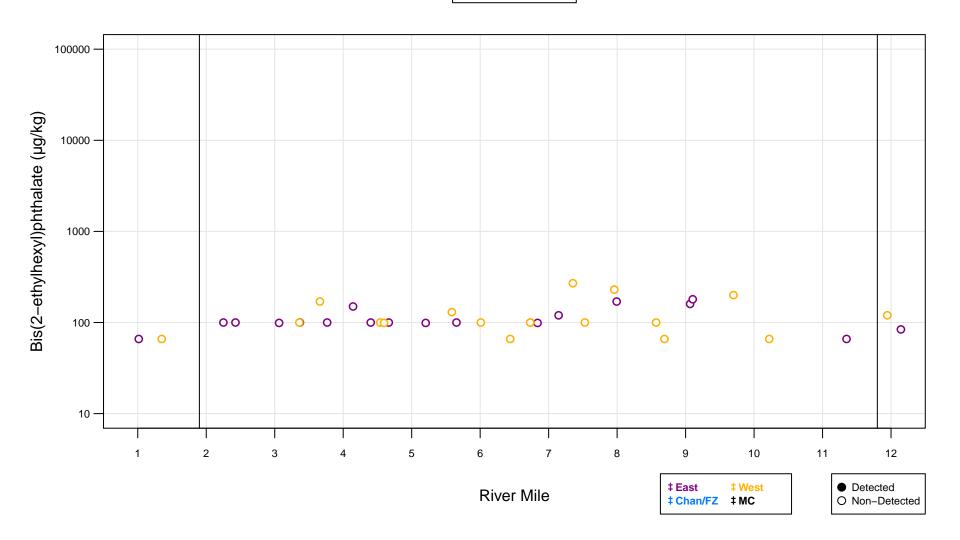


Figure 5.6-6b

O Sculpin, whole body

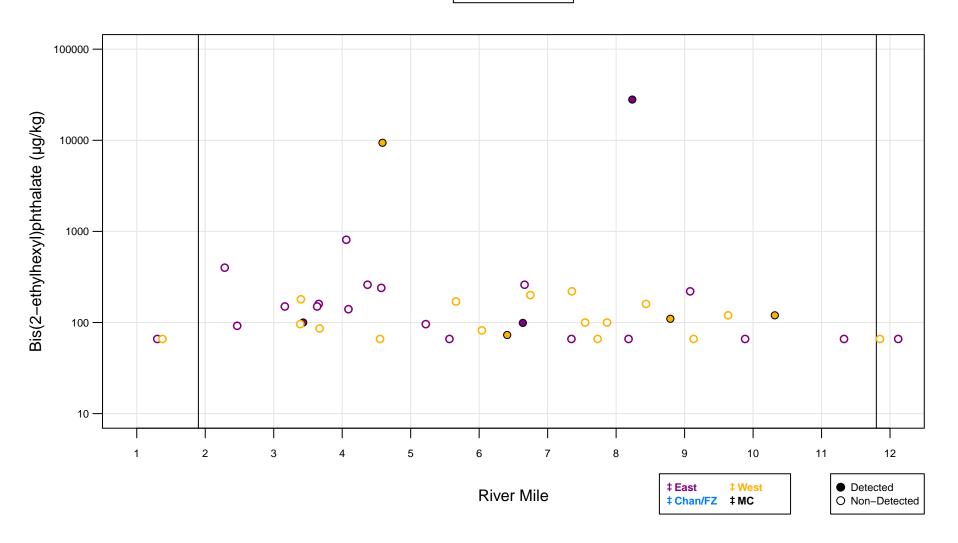


Figure 5.6-6c

O Smallmouth bass, whole body

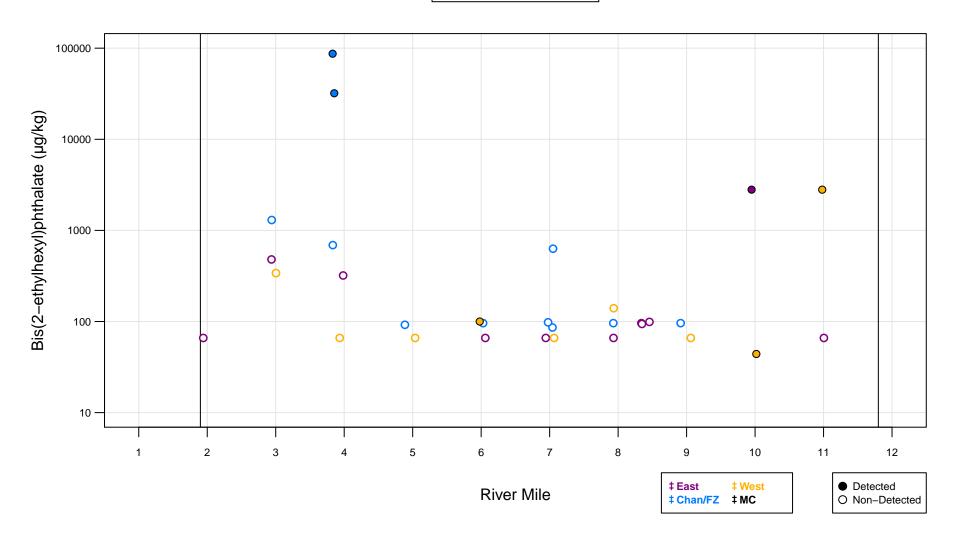


Figure 5.6-6d

O Lumbriculus, whole body

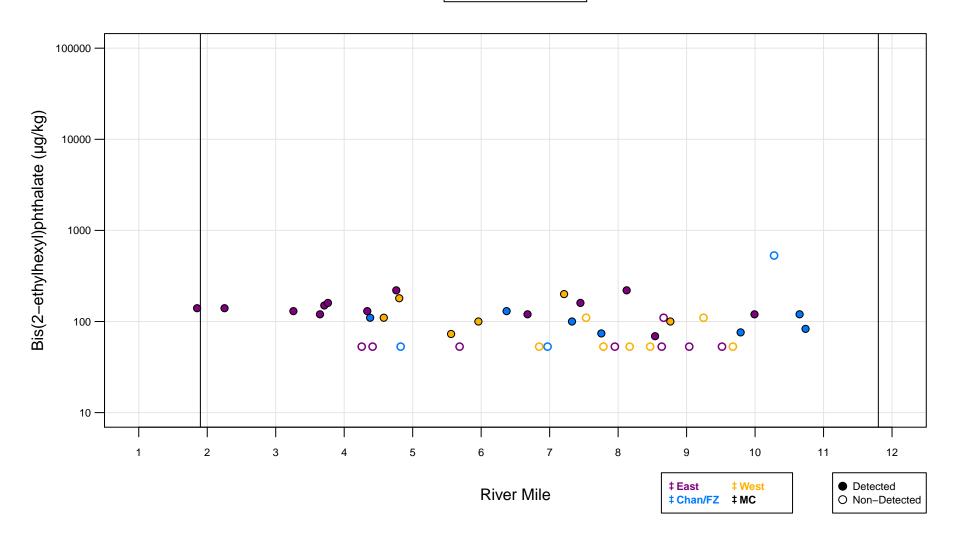


Figure 5.6-6e

○ Clam, depurated □ Clam, lab, not depurated ◇ Clam, not depurated

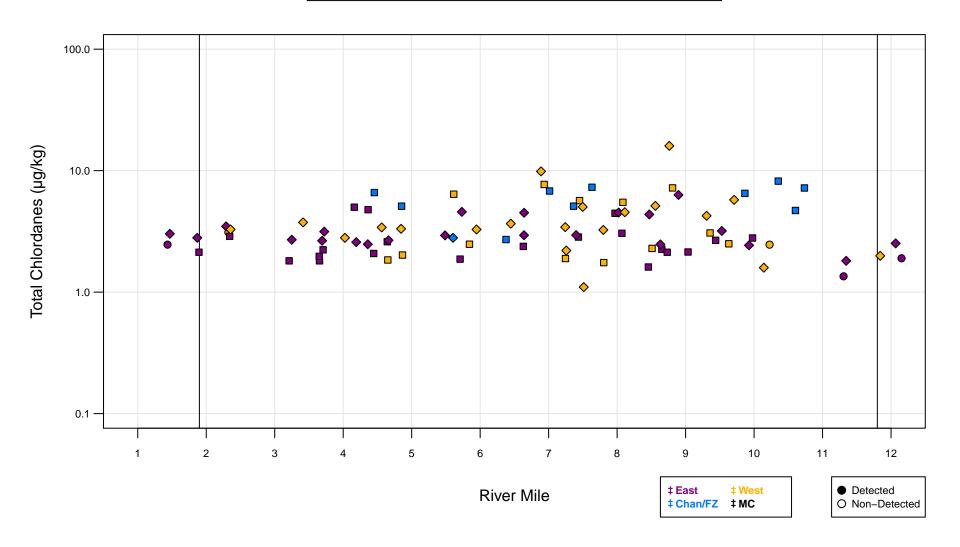


Figure 5.6-7a

O Crayfish, whole body

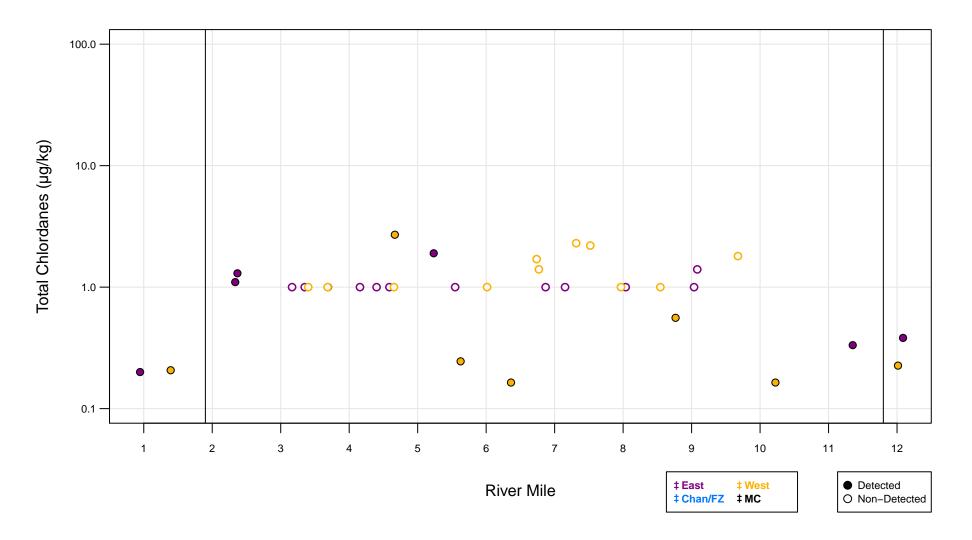


Figure 5.6-7b

O Sculpin, whole body

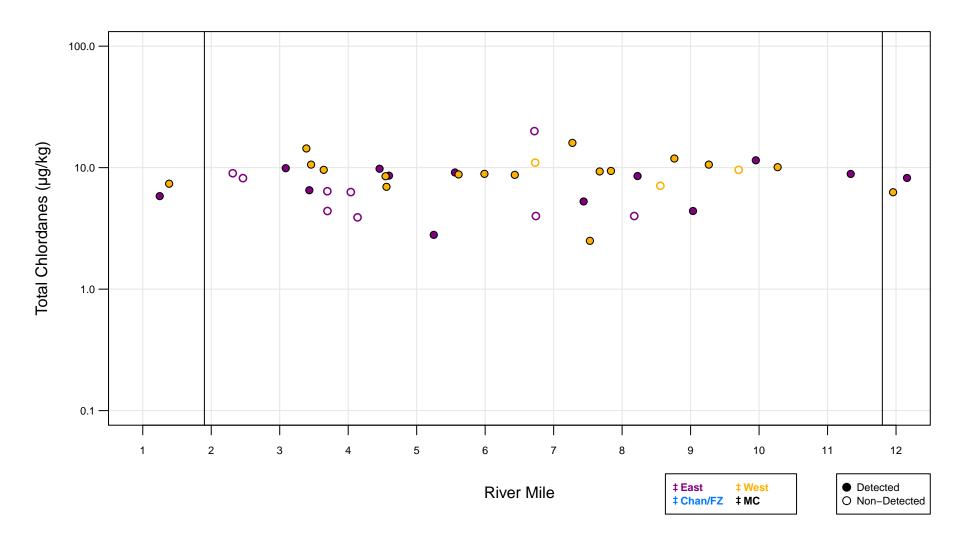


Figure 5.6-7c

O Smallmouth bass, whole body

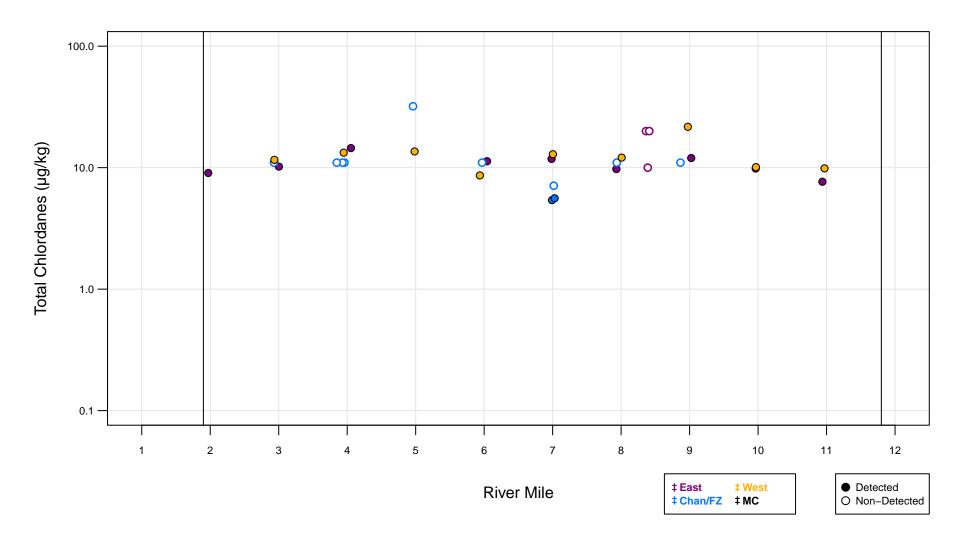


Figure 5.6-7d

O Lumbriculus, whole body

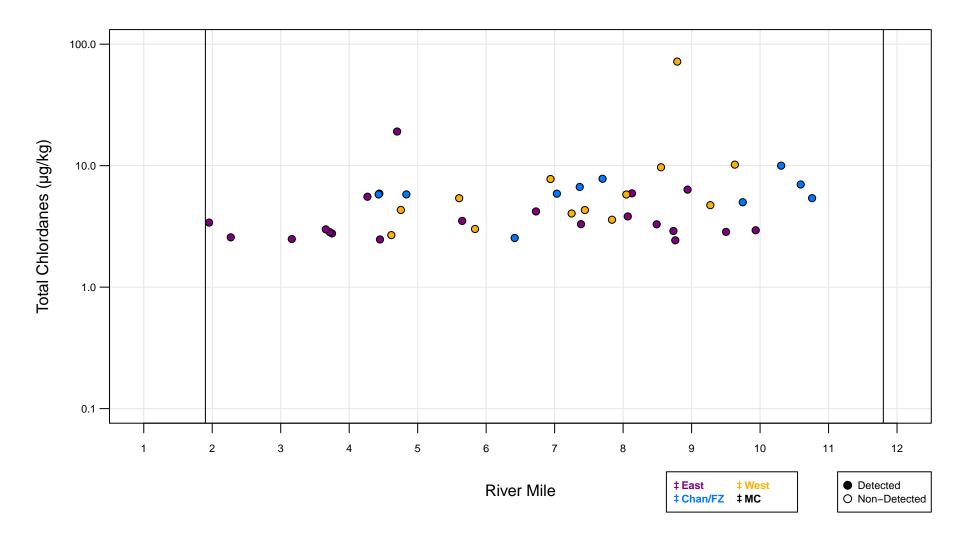


Figure 5.6-7e

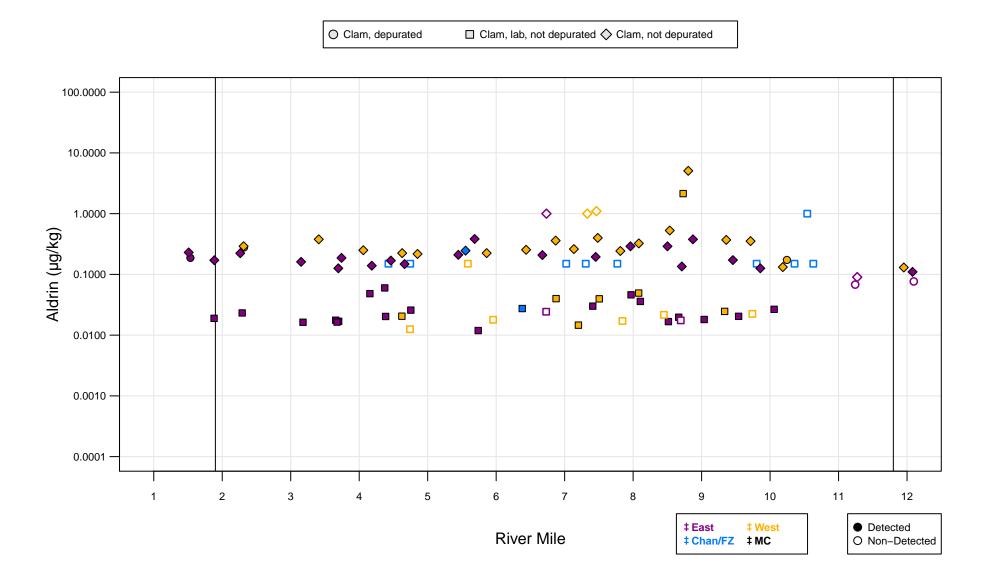
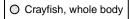


Figure 5.6-8a



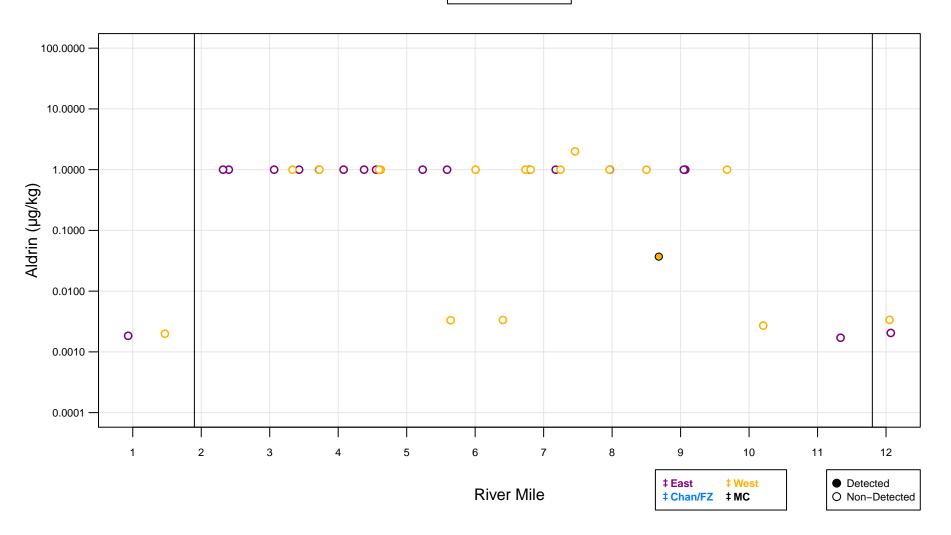


Figure 5.6-8b

O Sculpin, whole body

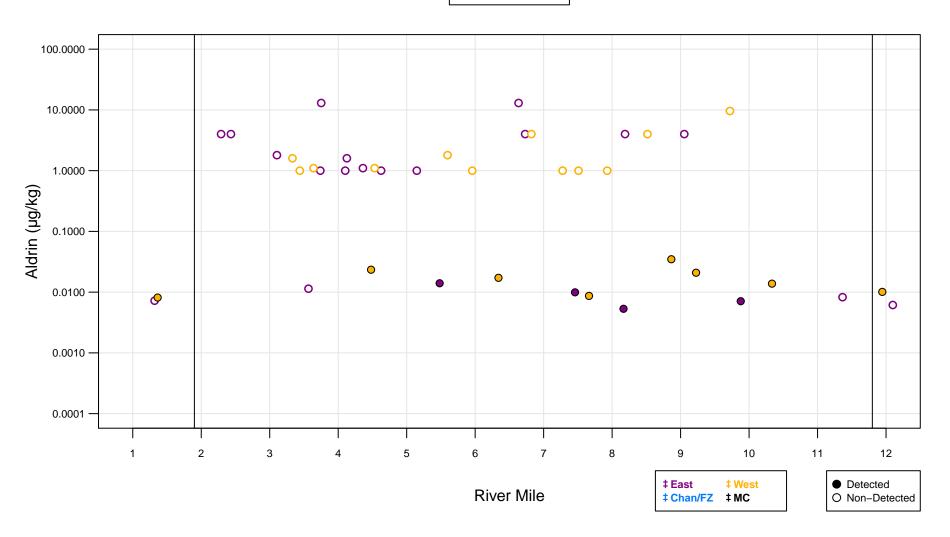


Figure 5.6-8c

O Smallmouth bass, whole body

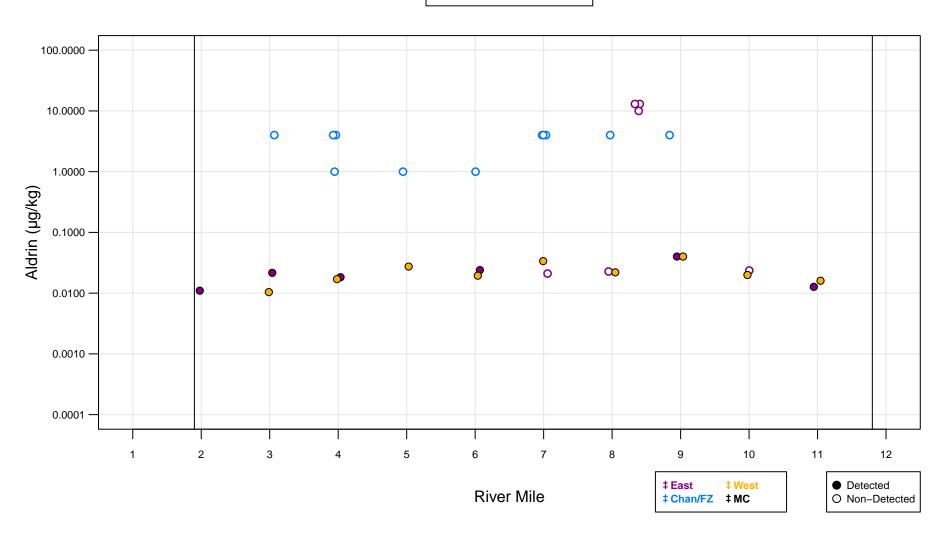


Figure 5.6-8d

O Lumbriculus, whole body

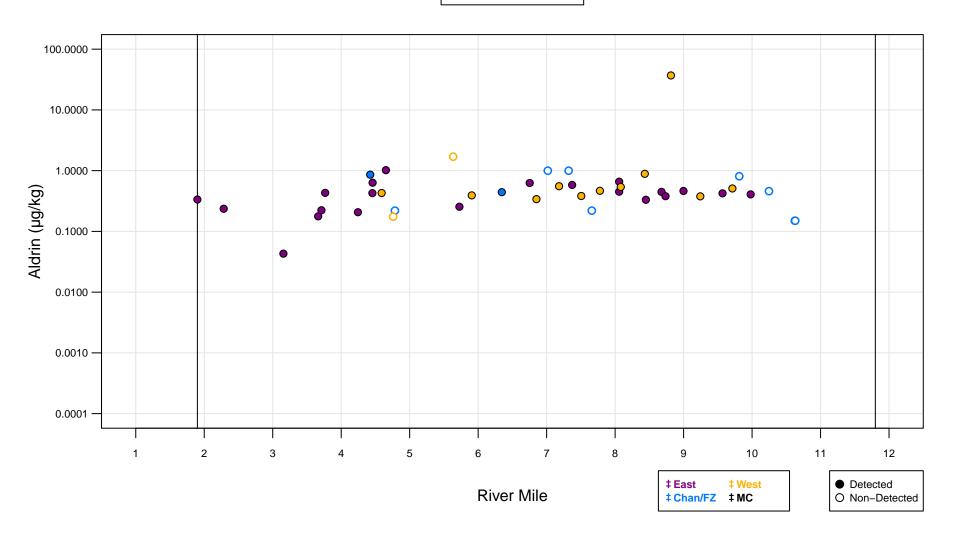


Figure 5.6-8e

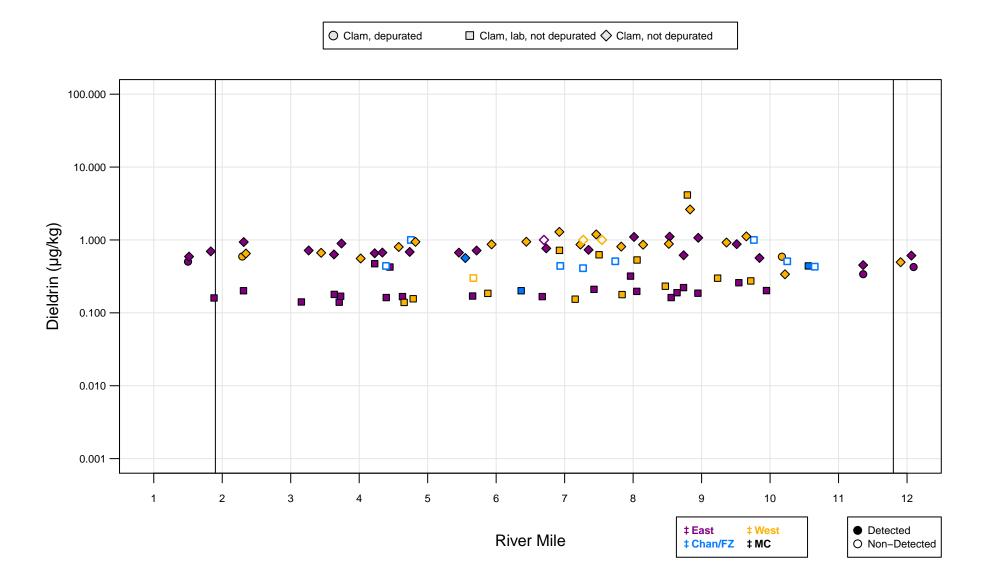
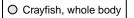


Figure 5.6-9a



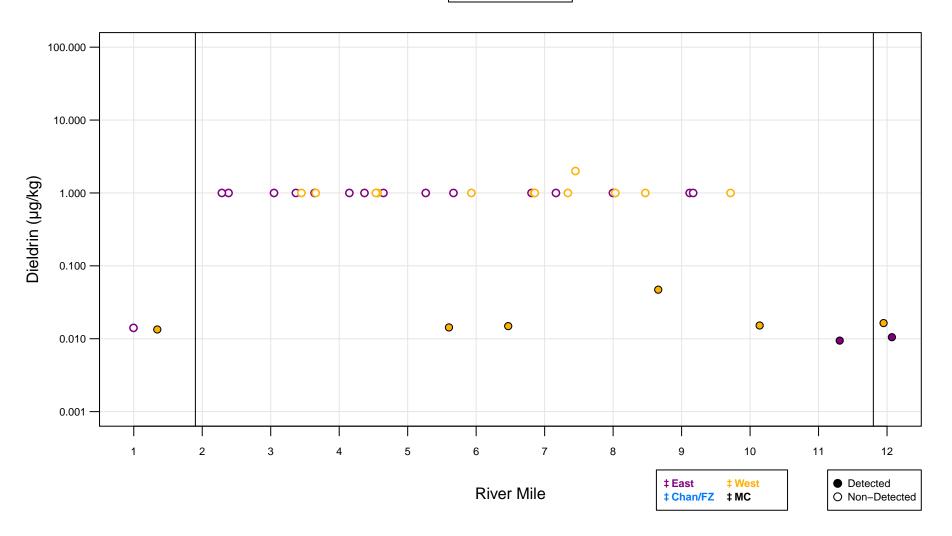


Figure 5.6-9b

O Sculpin, whole body

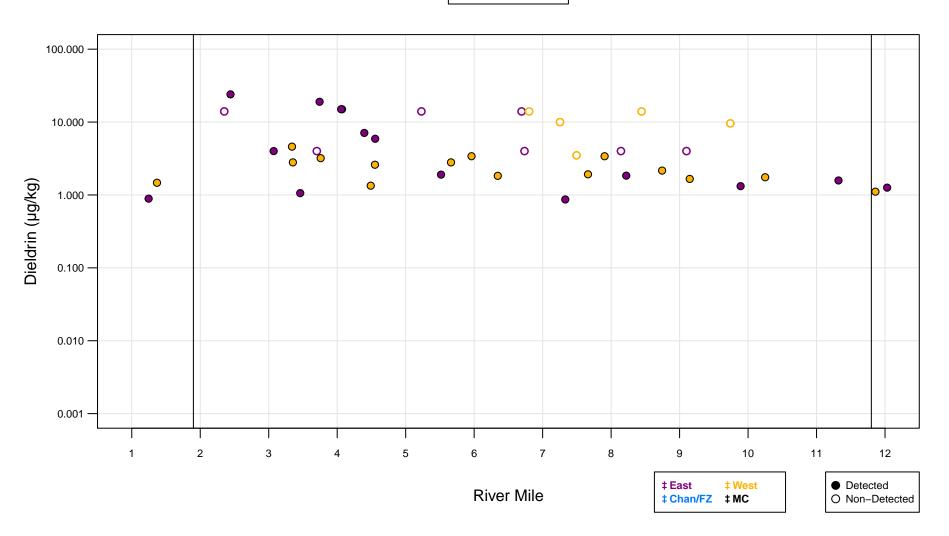


Figure 5.6-9c

O Smallmouth bass, whole body

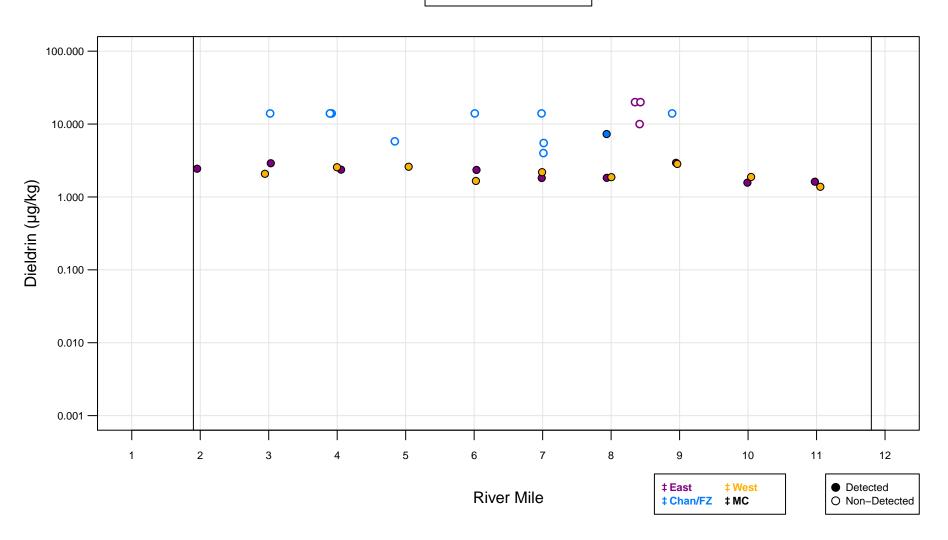


Figure 5.6-9d

O Lumbriculus, whole body

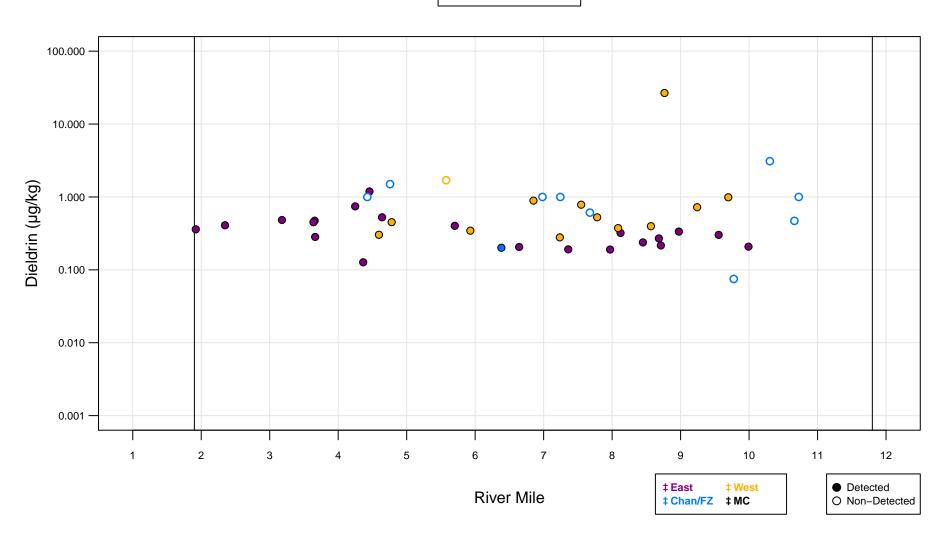


Figure 5.6-9e

○ Clam, depurated □ Clam, lab, not depurated ◇ Clam, not depurated

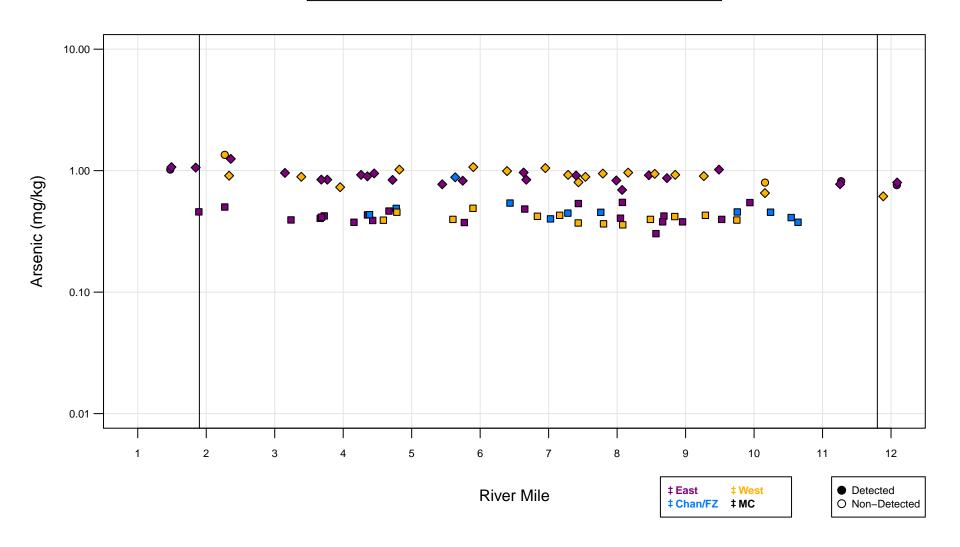


Figure 5.6-10a

O Crayfish, whole body

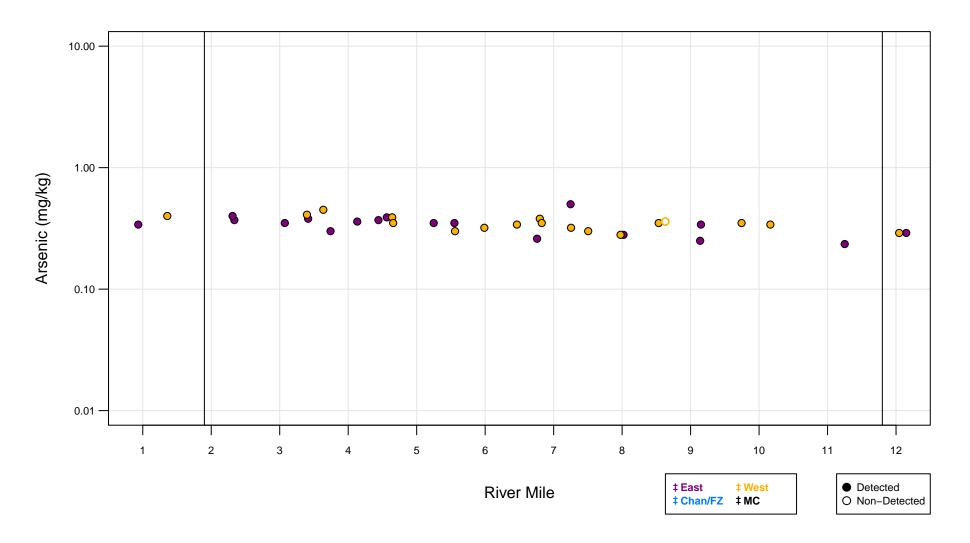


Figure 5.6-10b

O Sculpin, whole body

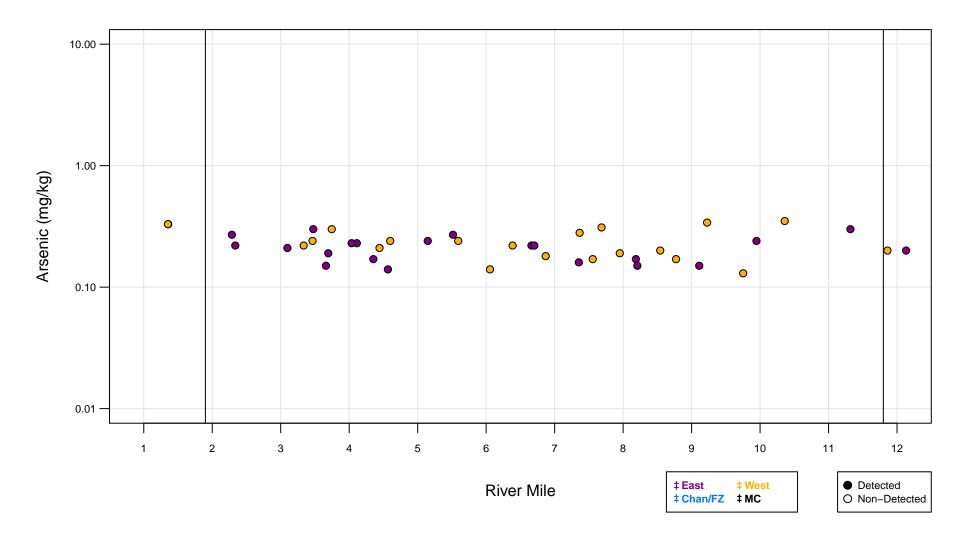


Figure 5.6-10c

O Smallmouth bass, whole body

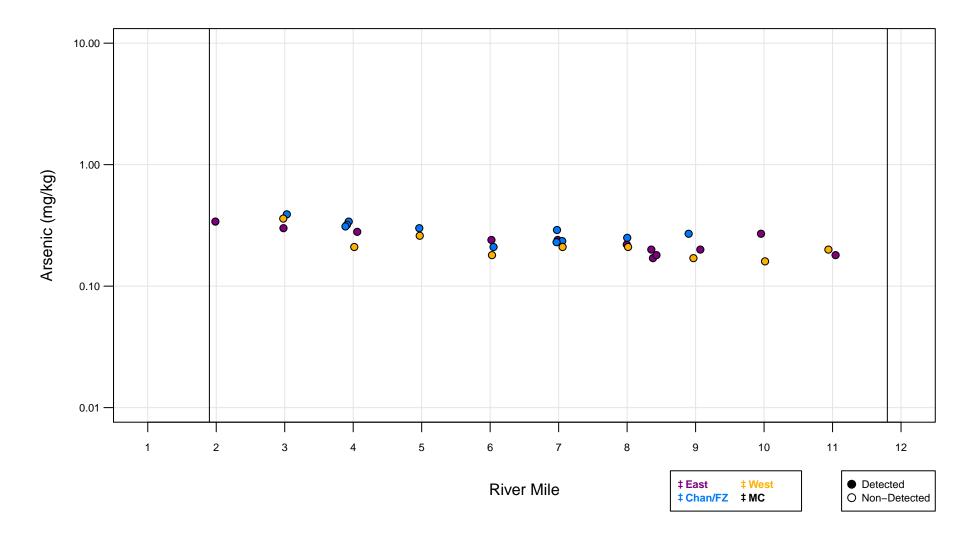


Figure 5.6-10d

O Lumbriculus, whole body

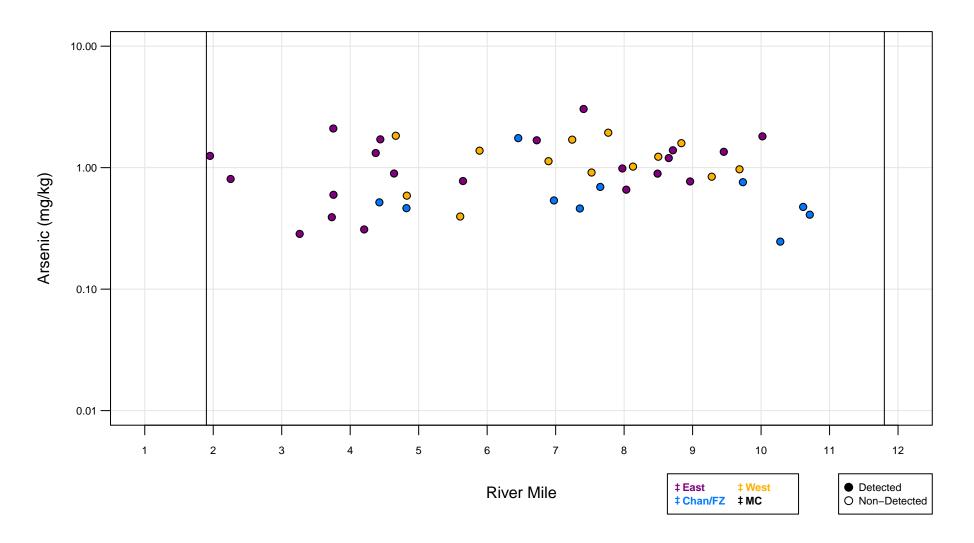


Figure 5.6-10e

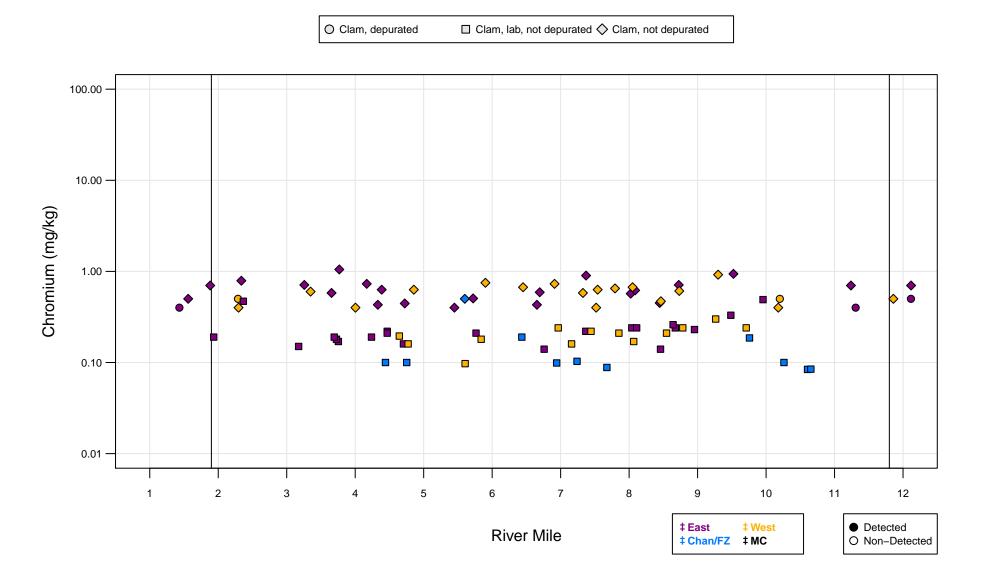


Figure 5.6-11a

O Crayfish, whole body

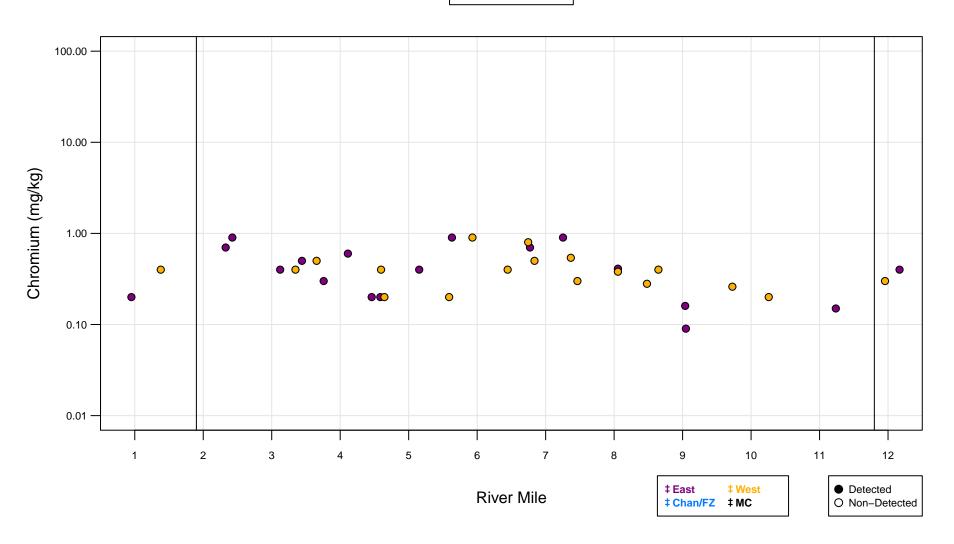


Figure 5.6-11b

O Sculpin, whole body

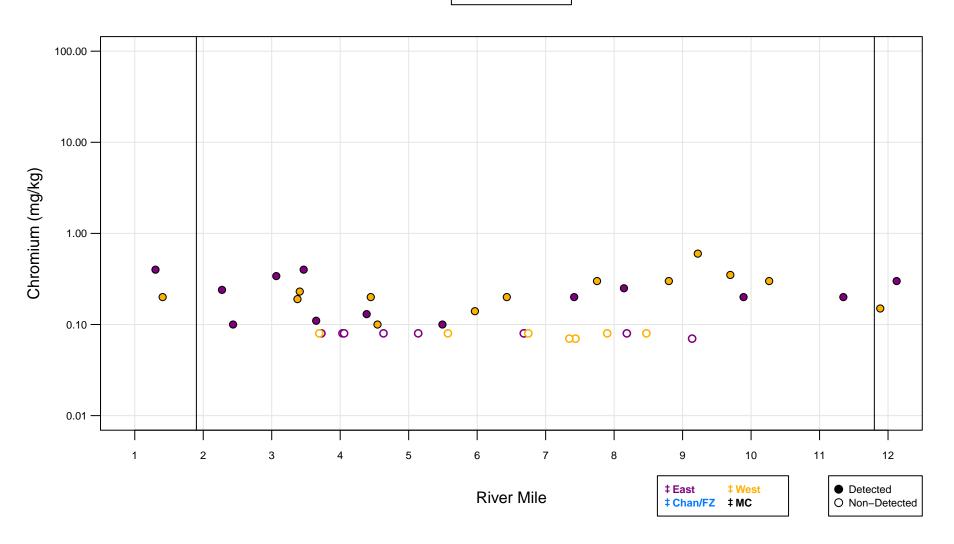


Figure 5.6-11c

O Smallmouth bass, whole body

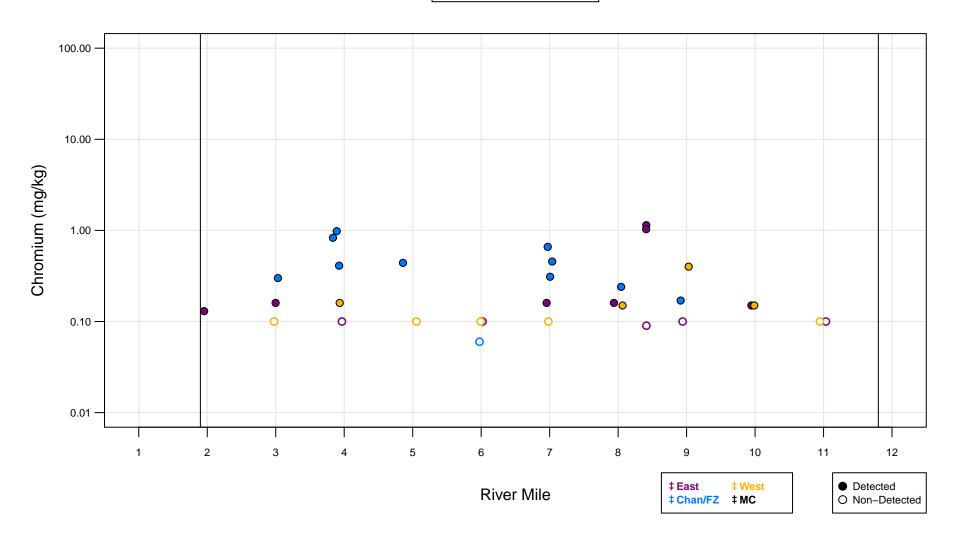


Figure 5.6-11d

O Lumbriculus, whole body

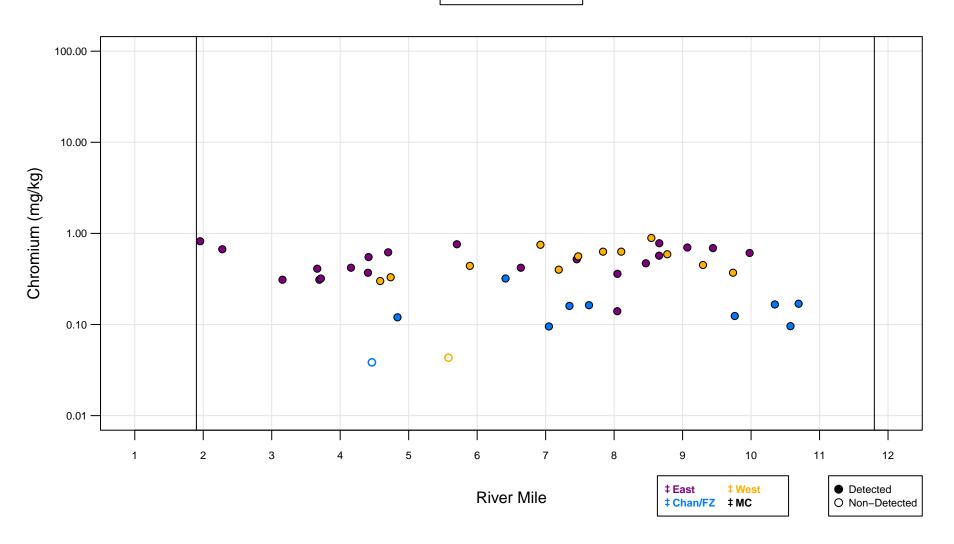


Figure 5.6-11e

○ Clam, depurated □ Clam, lab, not depurated ♦ Clam, not depurated

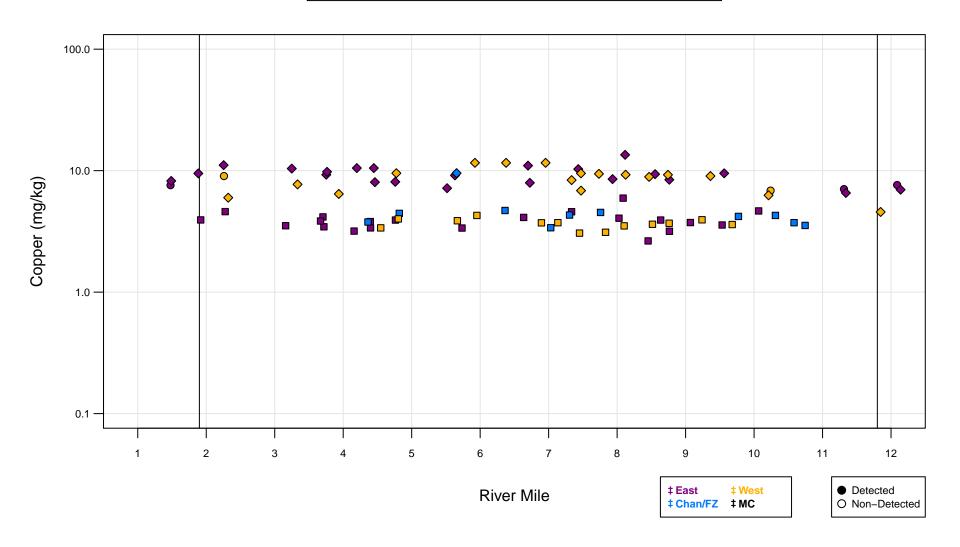


Figure 5.6-12a

O Crayfish, whole body

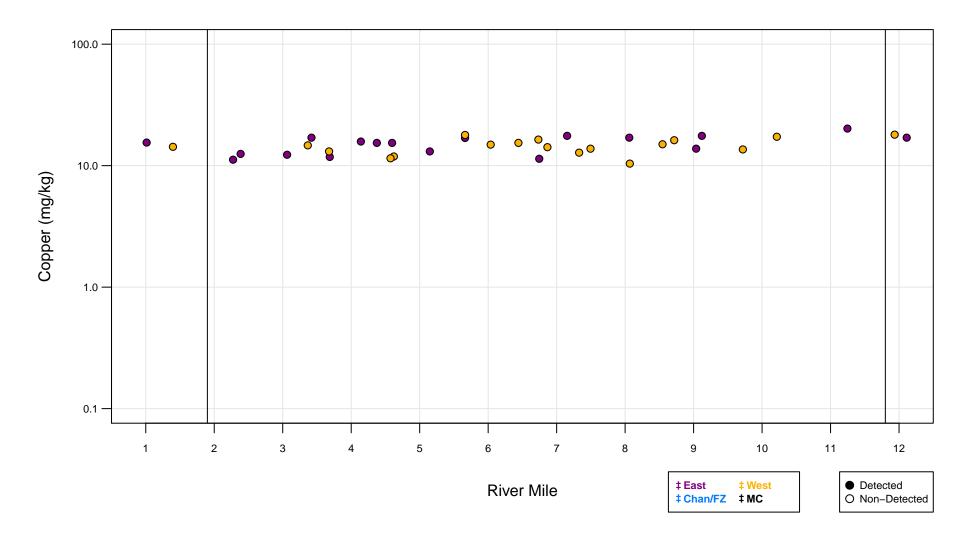


Figure 5.6-12b

O Sculpin, whole body

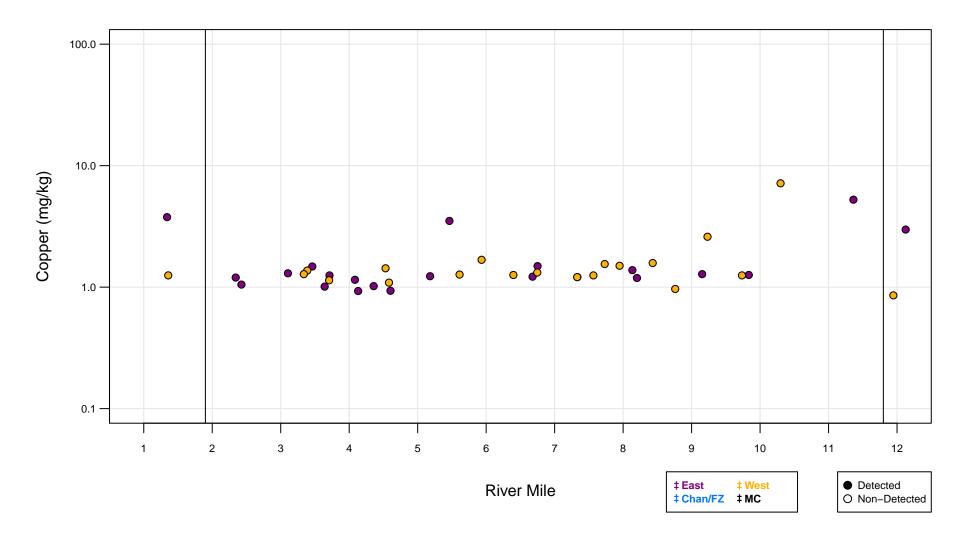


Figure 5.6-12c

O Smallmouth bass, whole body

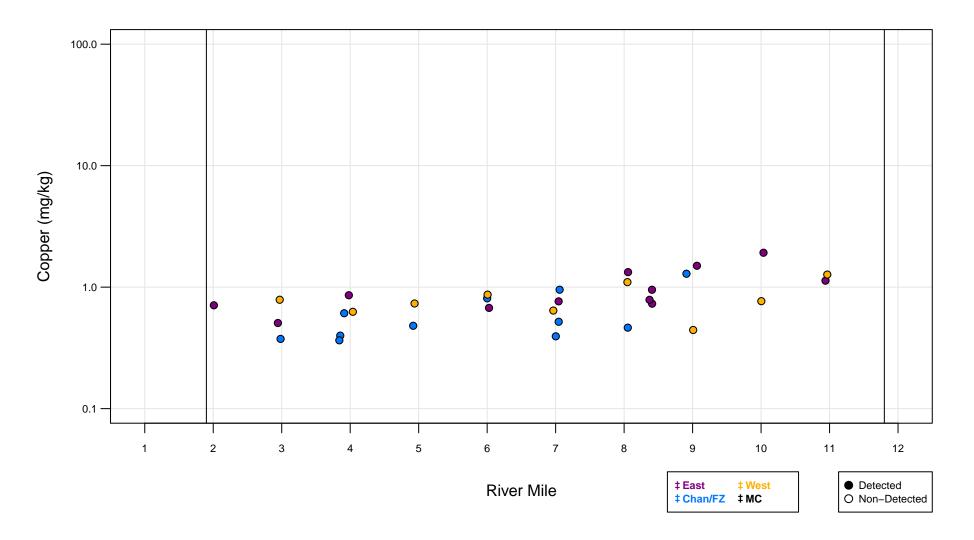


Figure 5.6-12d

O Lumbriculus, whole body

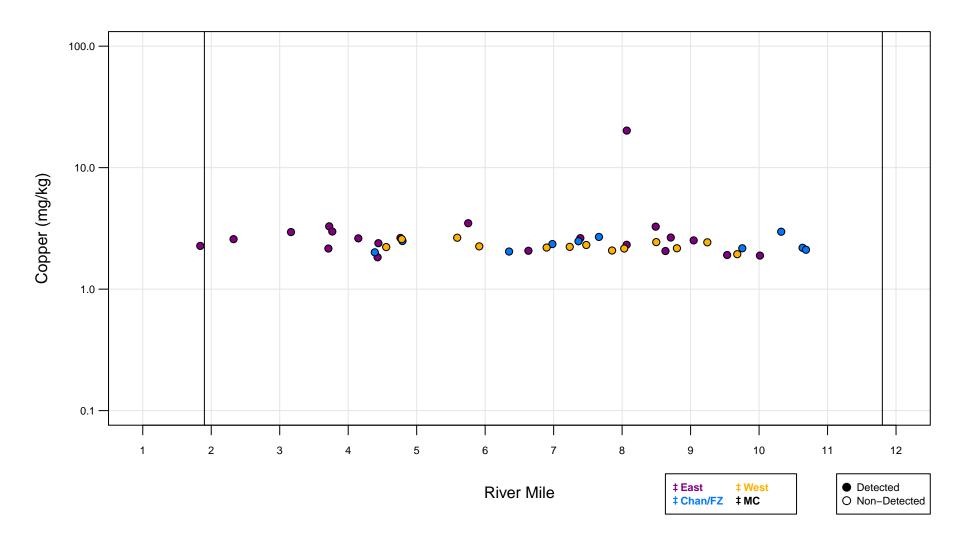
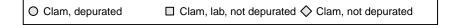


Figure 5.6-12e



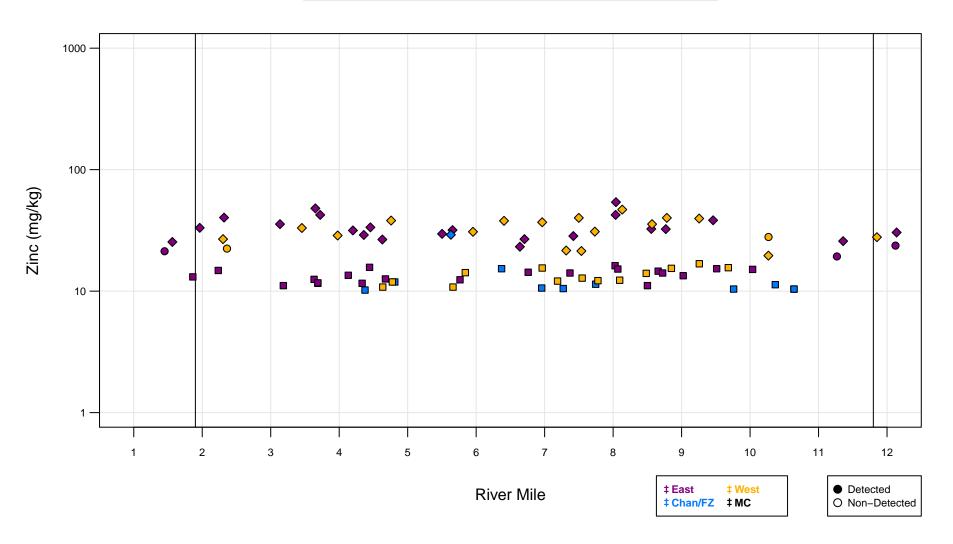


Figure 5.6-13a

O Crayfish, whole body

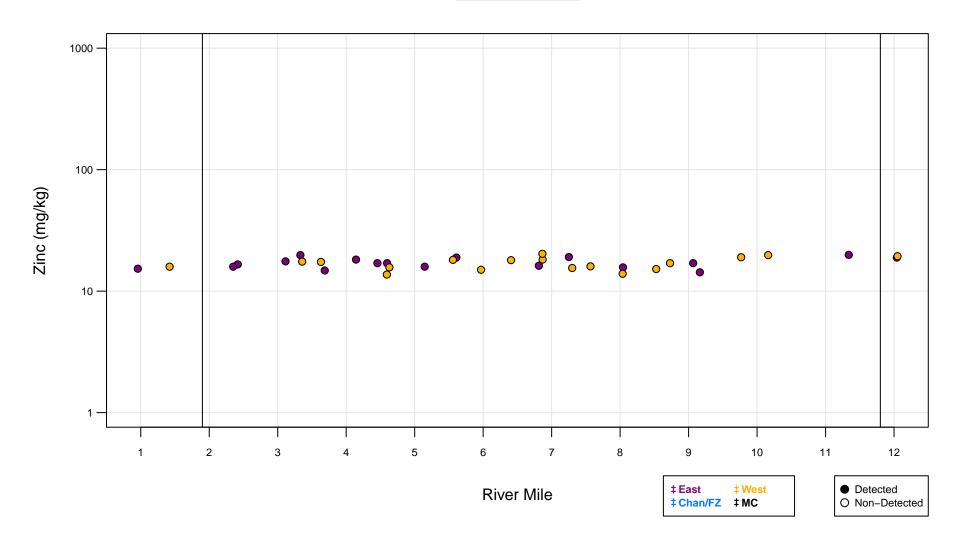


Figure 5.6-13b

O Sculpin, whole body

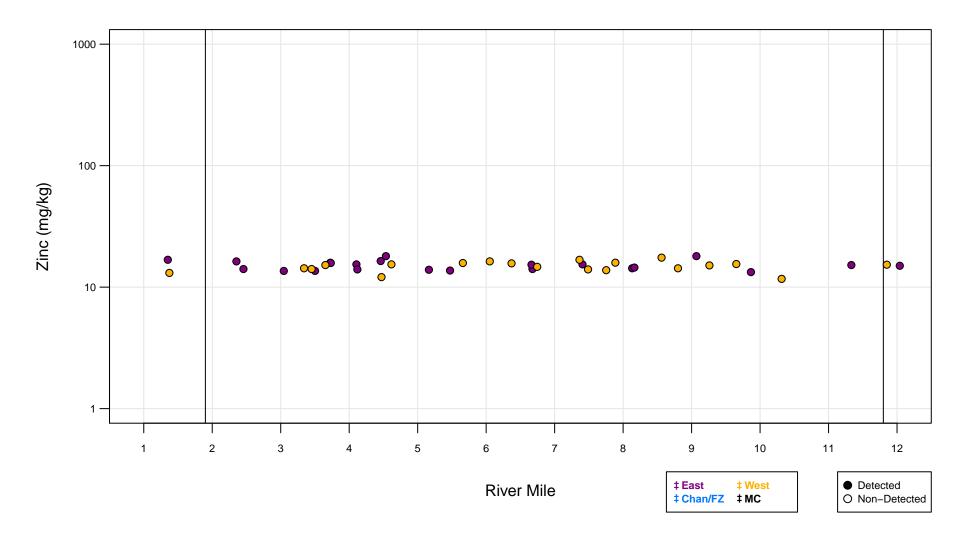


Figure 5.6-13c

O Smallmouth bass, whole body

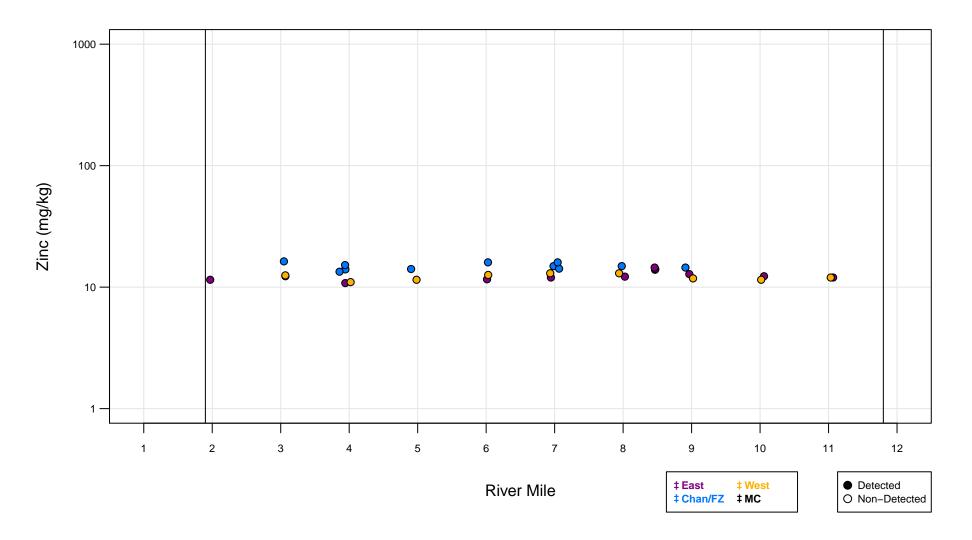


Figure 5.6-13d

O Lumbriculus, whole body

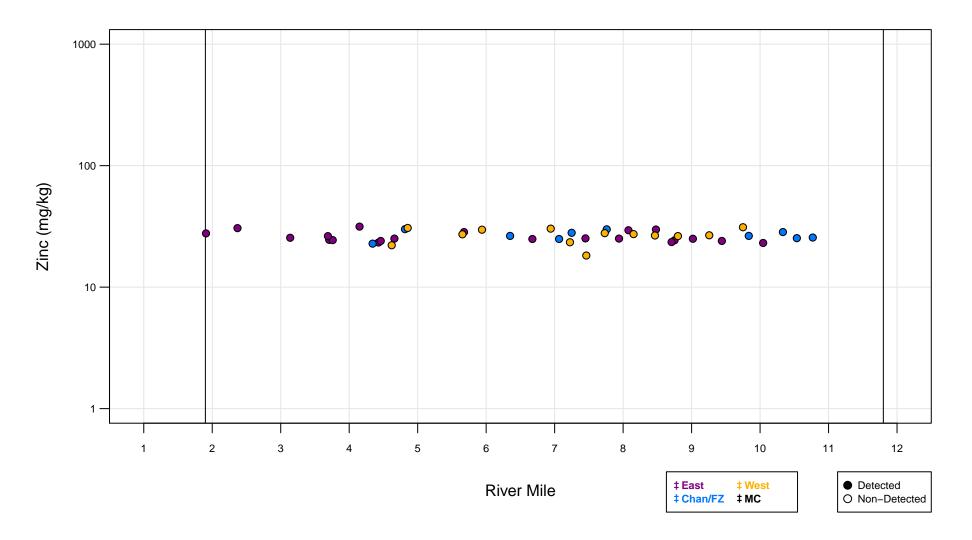


Figure 5.6-13e

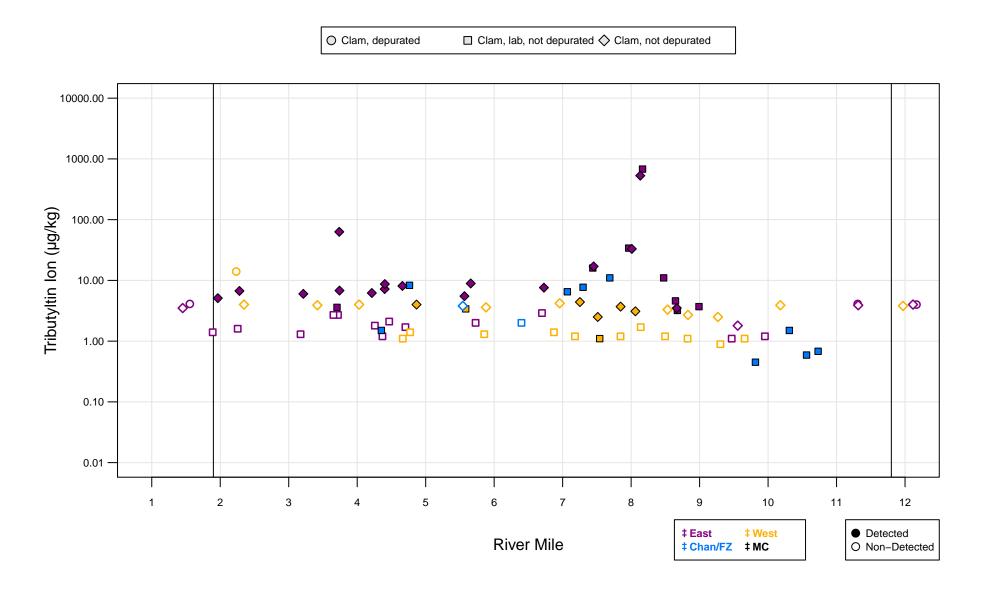
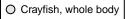


Figure 5.6-14a



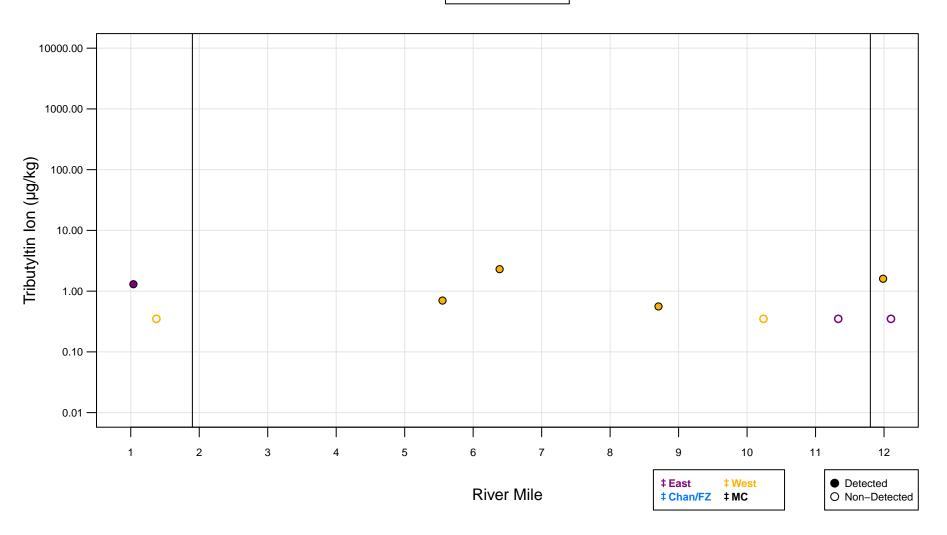
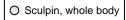


Figure 5.6-14b



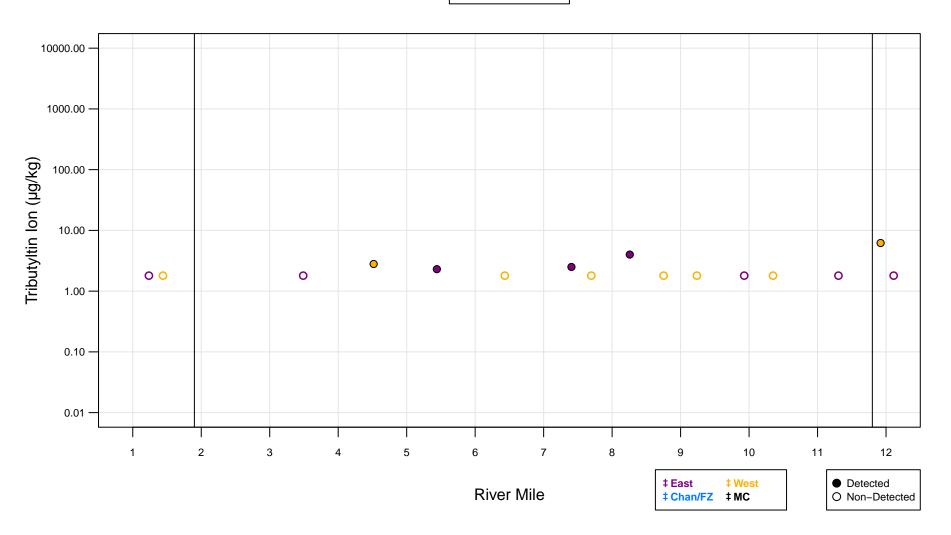


Figure 5.6-14c

O Smallmouth bass, whole body

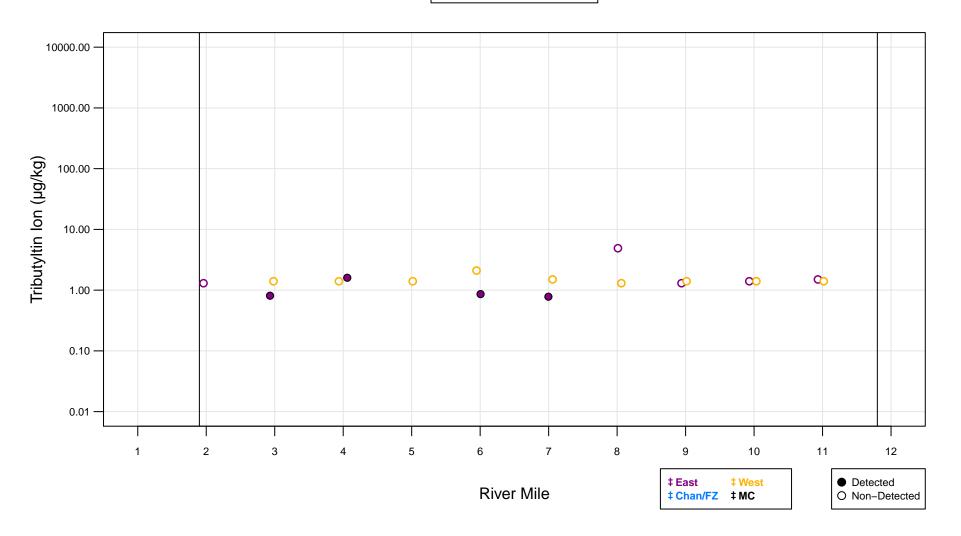


Figure 5.6-14d

O Lumbriculus, whole body

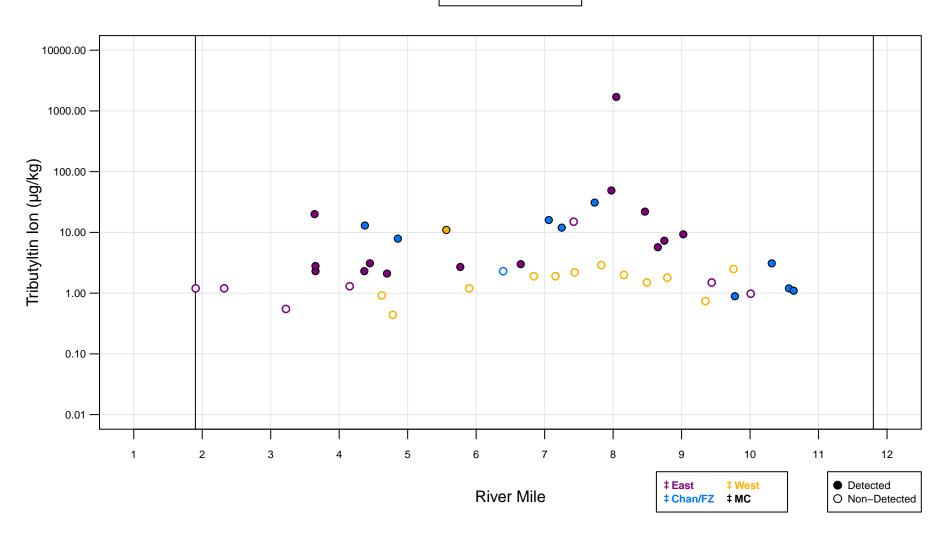


Figure 5.6-14e

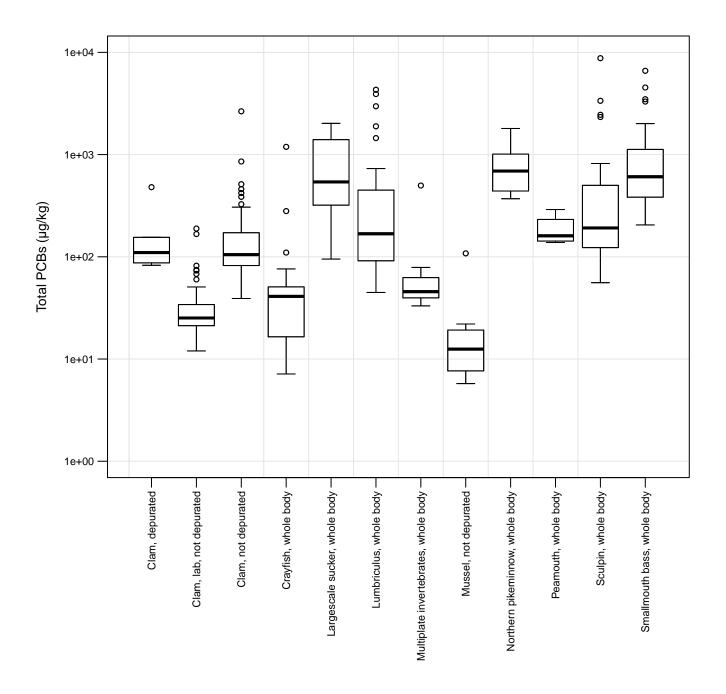


Figure 5.6–15
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected Total
PCBs in Biota (RM 0.8–12.2)

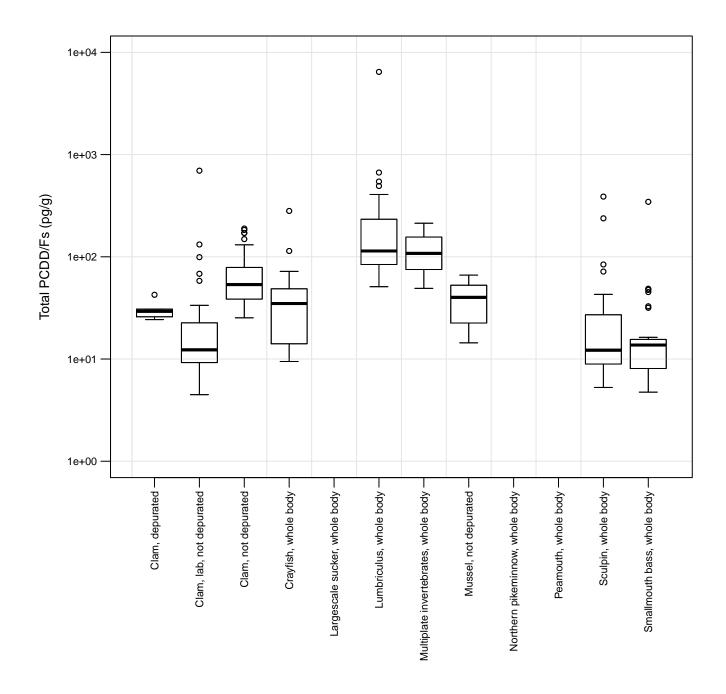


Figure 5.6–16
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Total PCDD/Fs in Biota (RM 0.8–12.2)

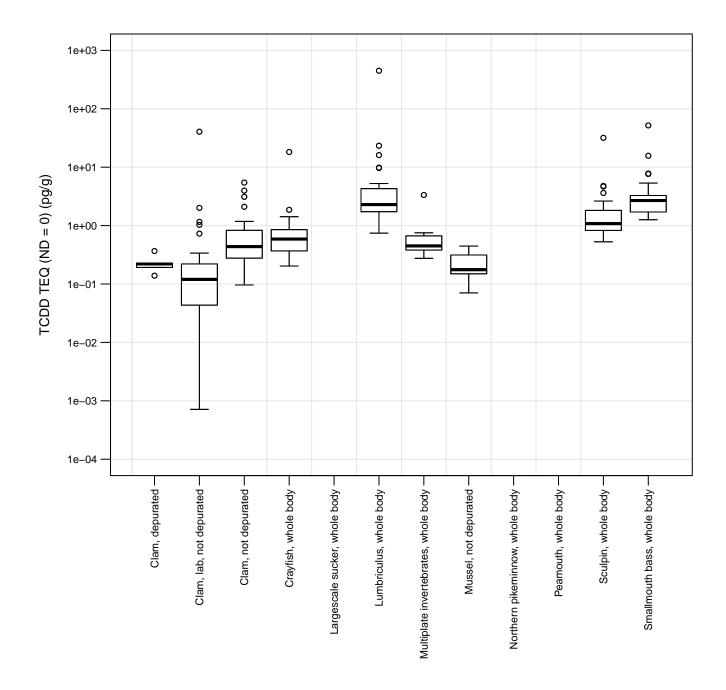


Figure 5.6–17
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
TCDD TEQ in Biota (RM 0.8–12.2)

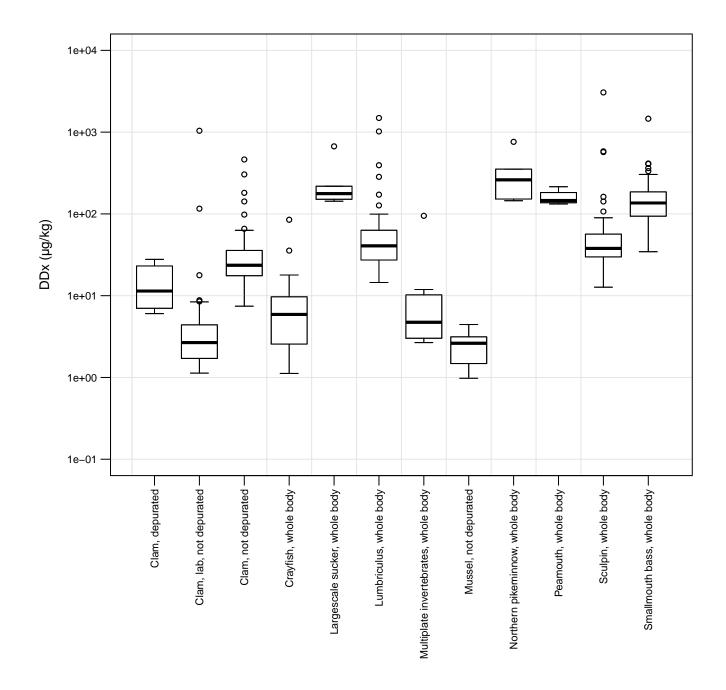


Figure 5.6–18
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
DDx in Biota (RM 0.8–12.2)

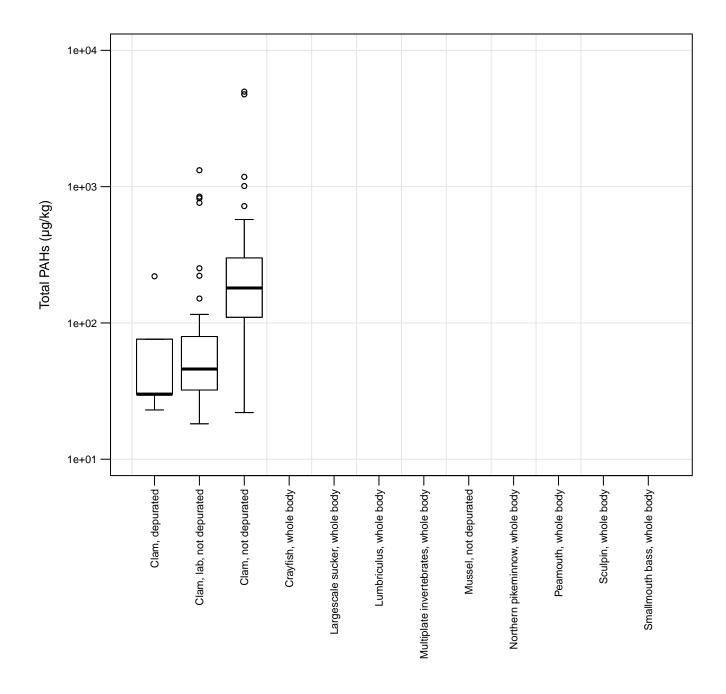


Figure 5.6–19
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Total PAHs in Biota (RM 0.8–12.2)

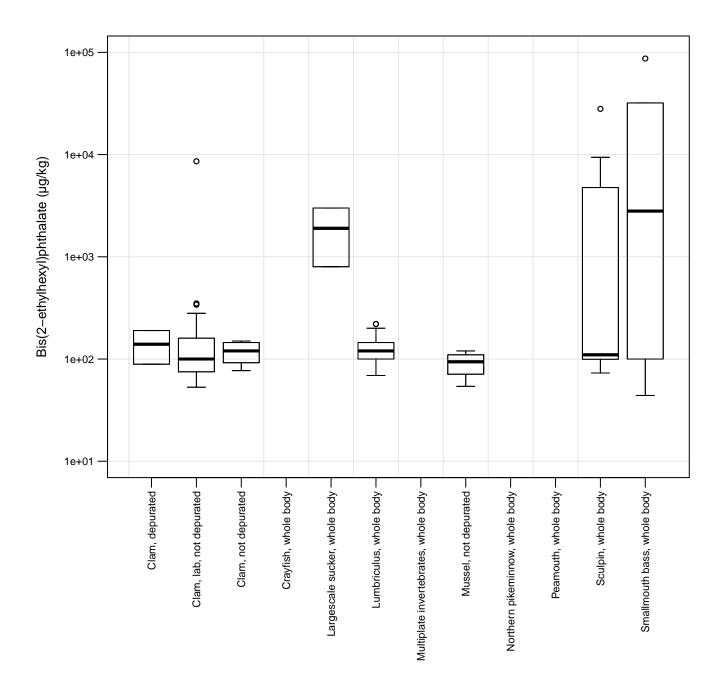


Figure 5.6–20
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Bis(2–ethylhexyl)phthalate in Biota (RM 0.8–12.2)

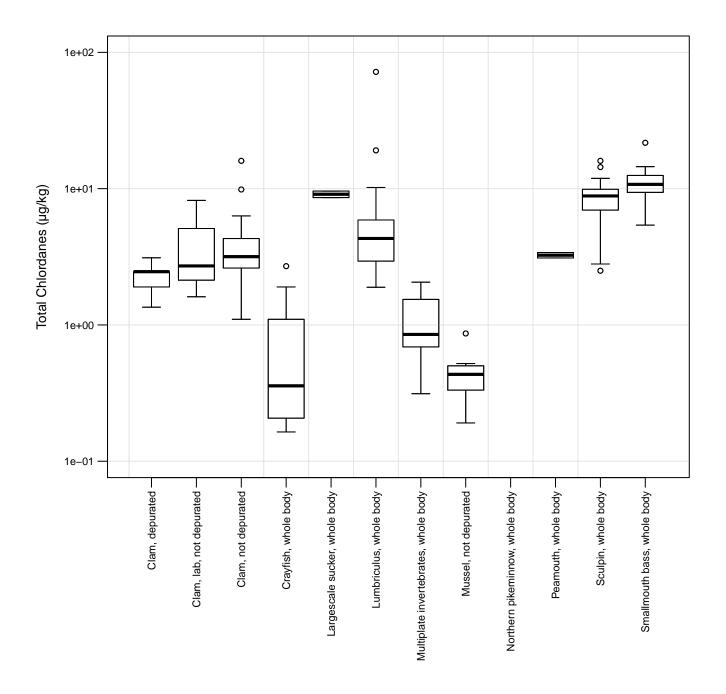


Figure 5.6–21
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Total Chlordanes in Biota (RM 0.8–12.2)

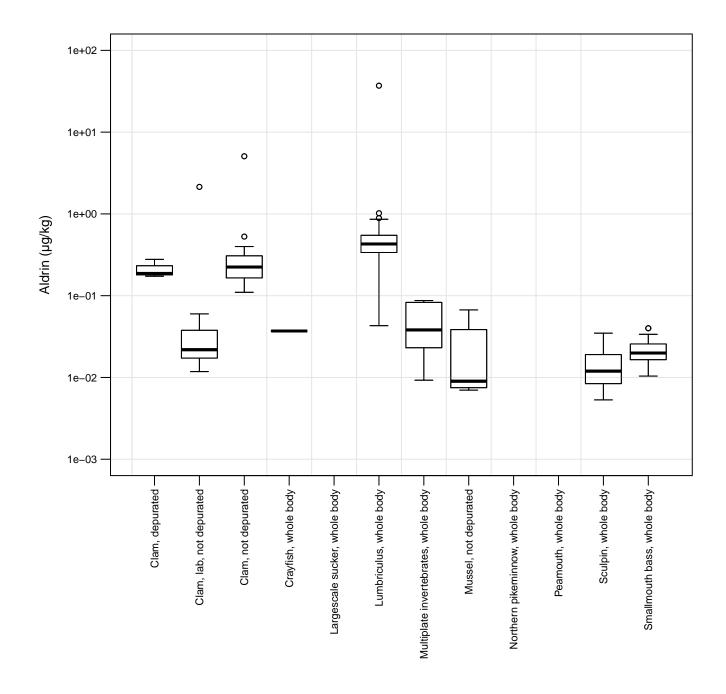


Figure 5.6–22
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Aldrin in Biota (RM 0.8–12.2)

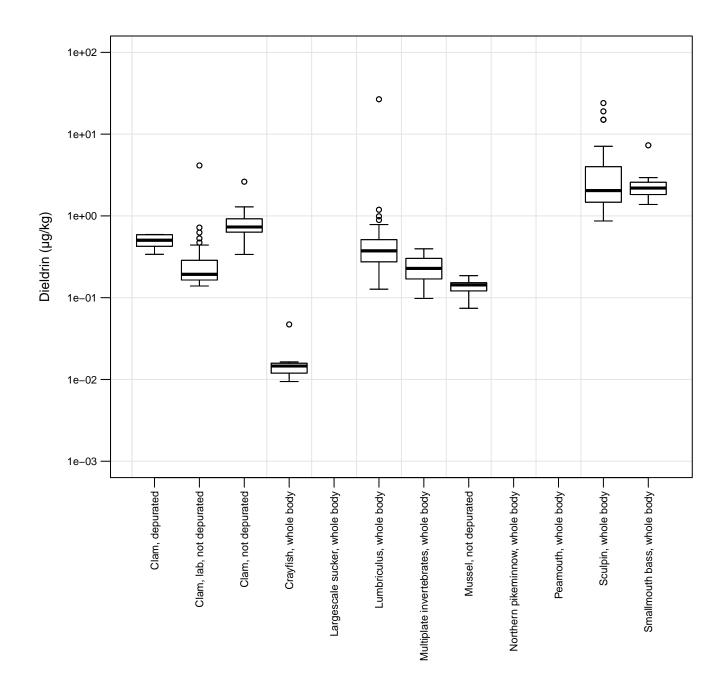


Figure 5.6–23
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Dieldrin in Biota (RM 0.8–12.2)

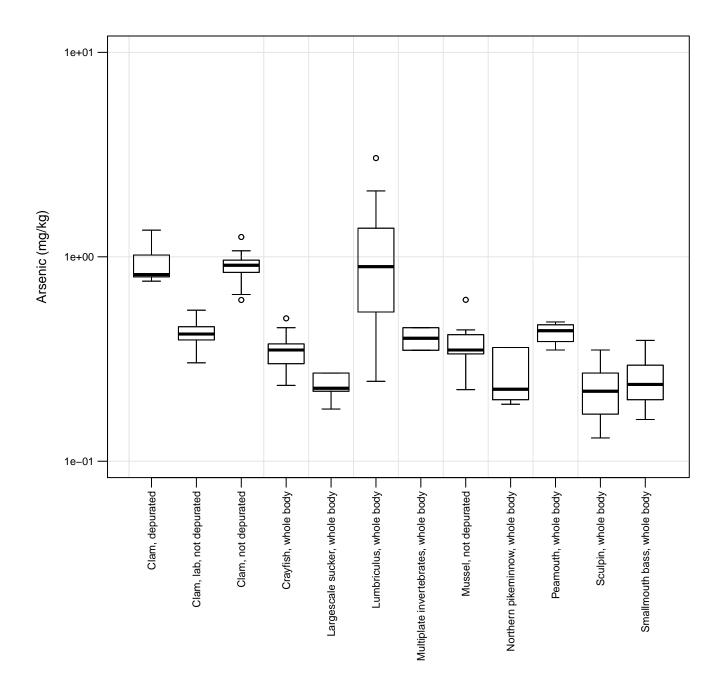


Figure 5.6–24
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Arsenic in Biota (RM 0.8–12.2)

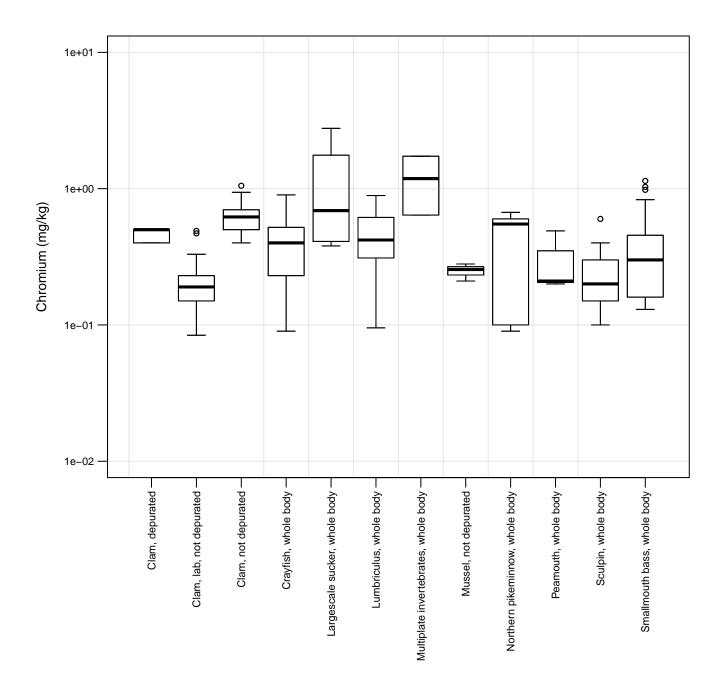


Figure 5.6–25
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Chromium in Biota (RM 0.8–12.2)

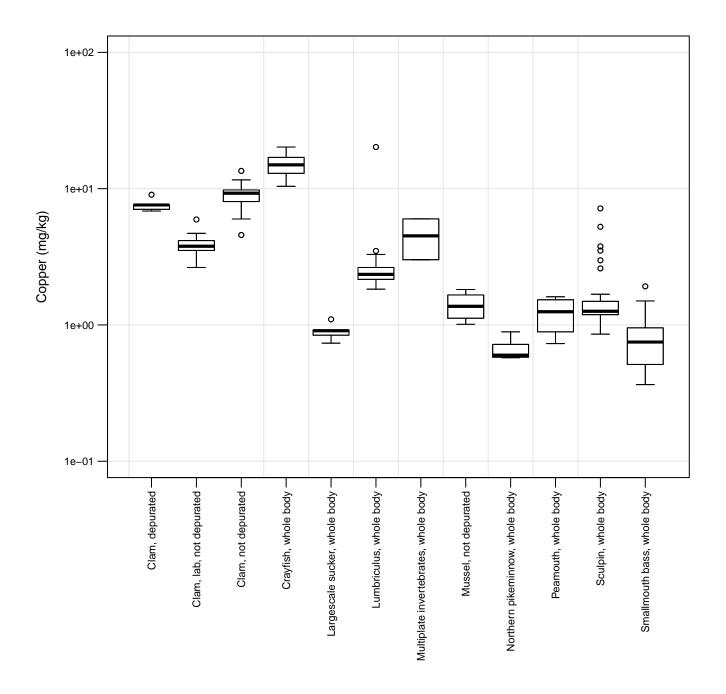


Figure 5.6–26
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Copper in Biota (RM 0.8–12.2)

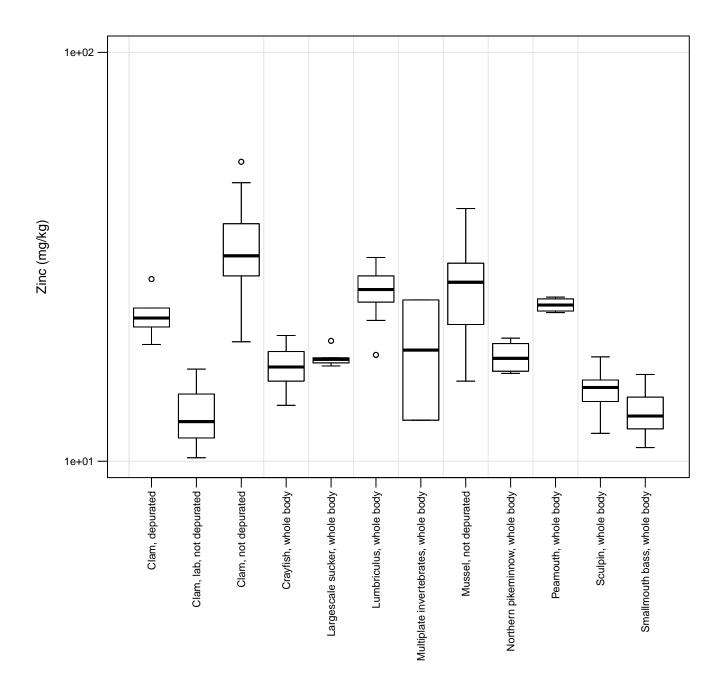


Figure 5.6–27
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected Zinc
in Biota (RM 0.8–12.2)

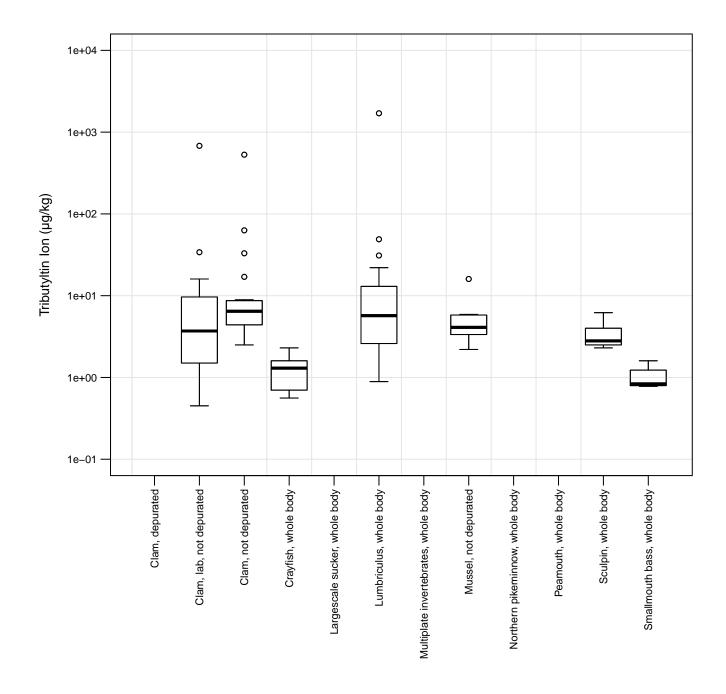
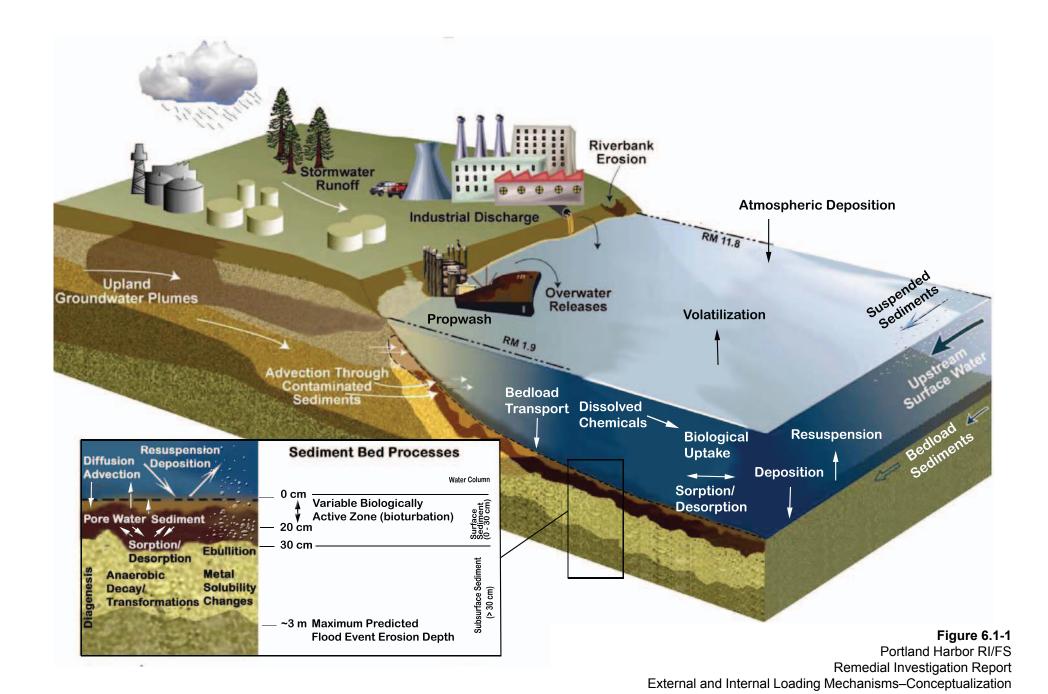
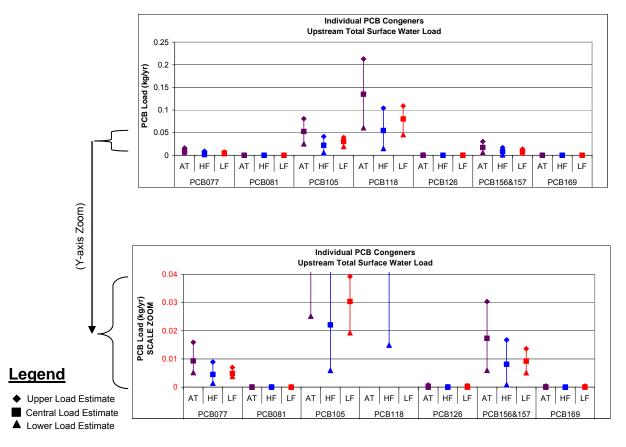


Figure 5.6–28
Portland Harbor RI/FS
Remedial Investigation Report
Box–Whisker Plot of Detected
Tributyltin Ion in Biota (RM 0.8–12.2)

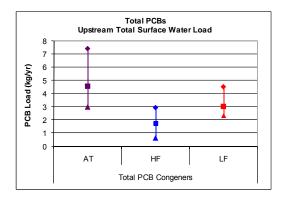




AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total



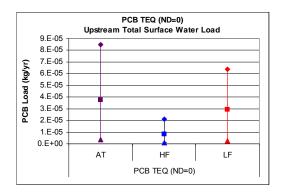
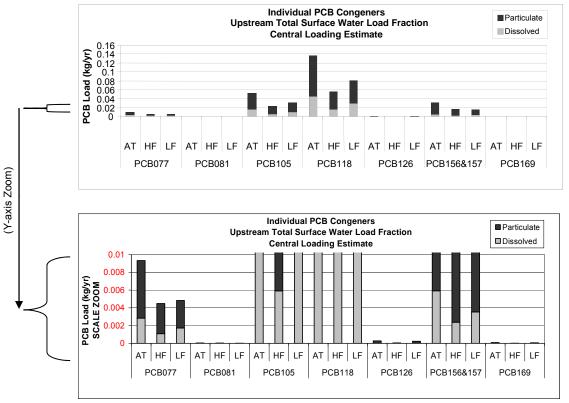


Figure 6.1-2
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
PCBs – Upstream

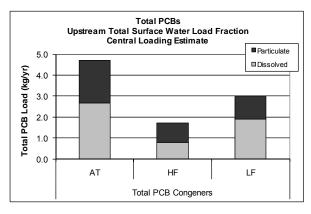




Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total



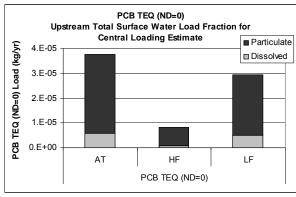
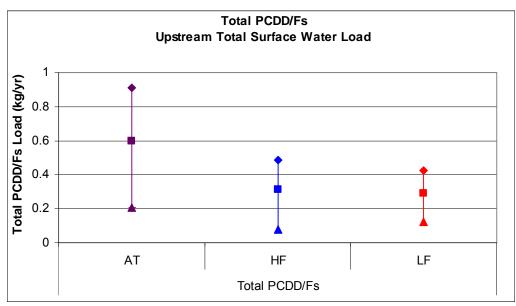
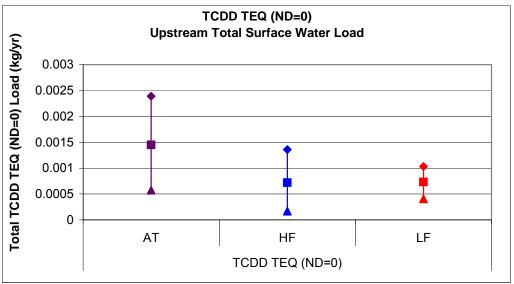


Figure 6.1-3
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
PCBs – Upstream





Legend

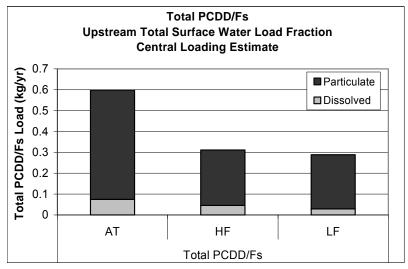
- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

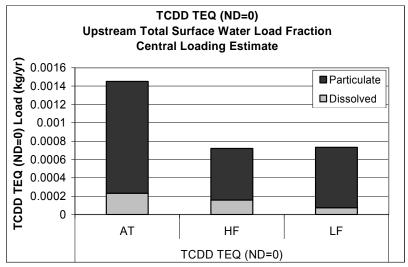
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-4
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Total PCDD/Fs and TCDD TEQ (ND=0) – Upstream



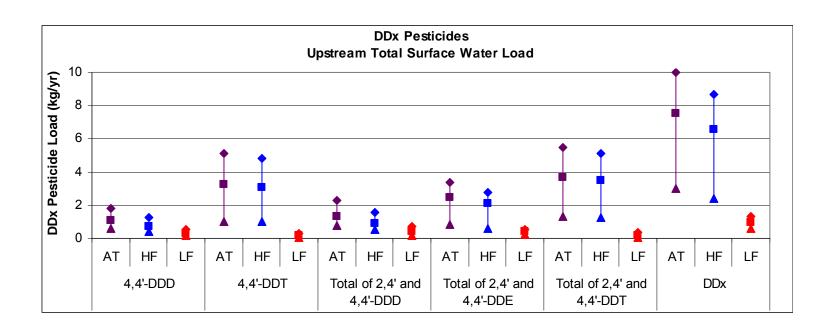


Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-5
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
Total PCDD/Fs and TCDD TEQ (ND=0) – Upstream



Legend

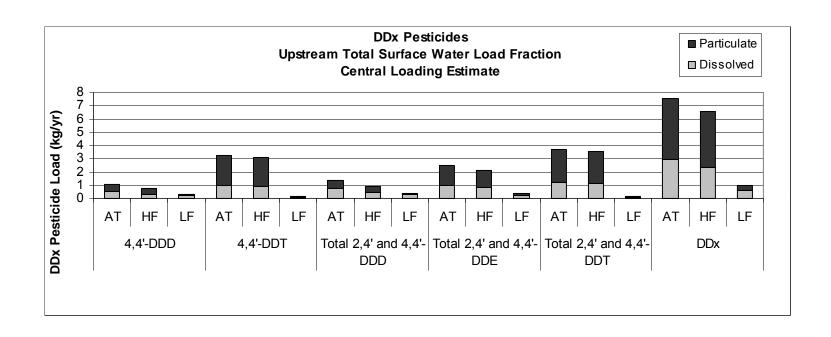
- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-6
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Surface Water Loading Ranges
DDx Pesticides – Upstream

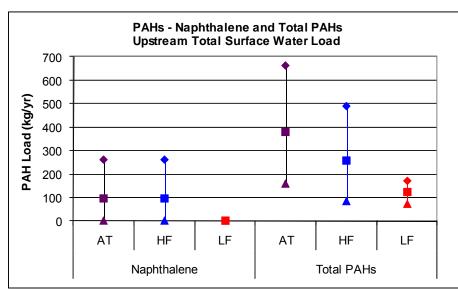


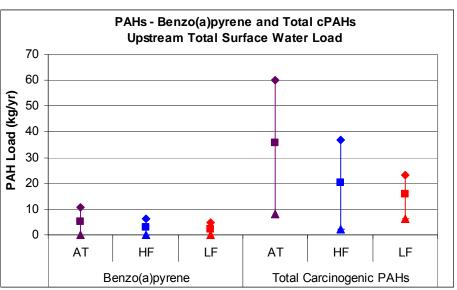
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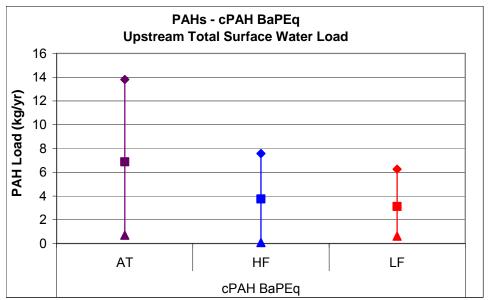
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-7
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions
DDx Pesticides – Upstream







Legend

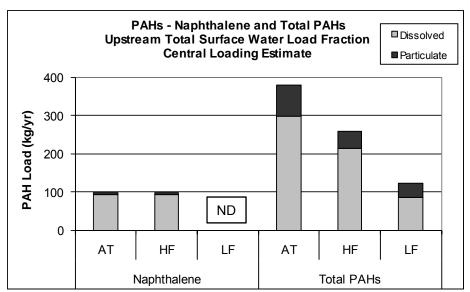
- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

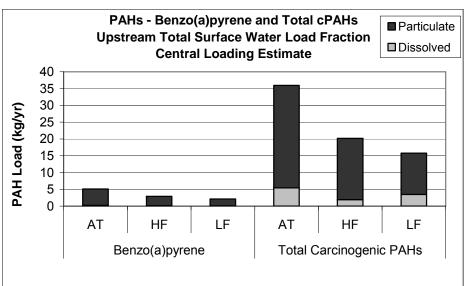
AT: Annual total

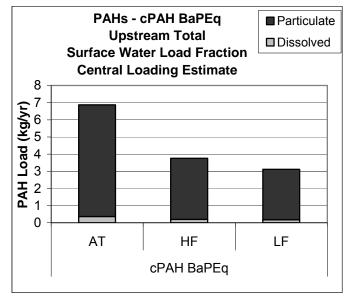
HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-8
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
PAHs – Upstream







Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

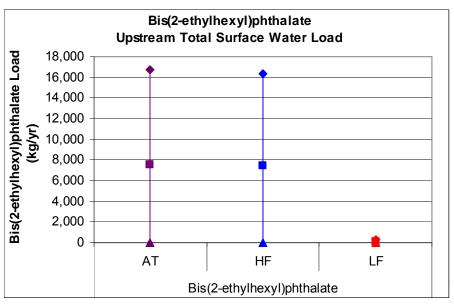
LF: Low flow (< 50,000 cfs) portion of annual total

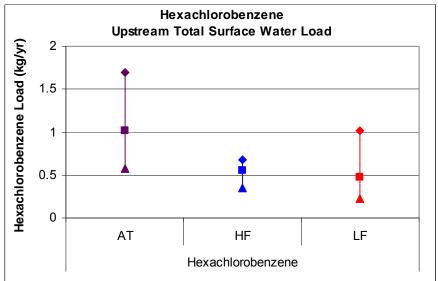
ND: Data below laboratory detection limit. Value set

equal to 0 prior to loading calculations

Figure 6.1-9
Portland Harbor RI/FS
Remedial Investigation Report

Bar Charts of Surface Water Loading Fractions
PAHs – Upstream





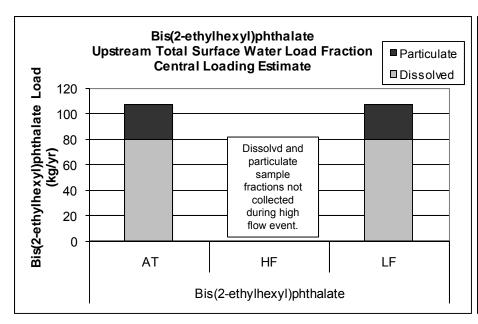
- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

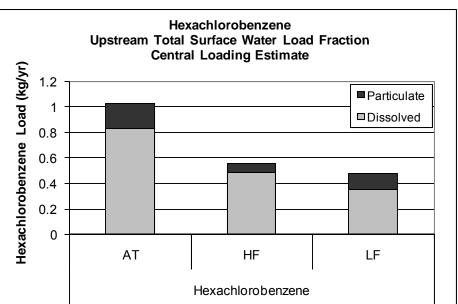
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-10
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Bis(2-ethylhexyl)phthalate and Hexachlorobenzene – Upstream



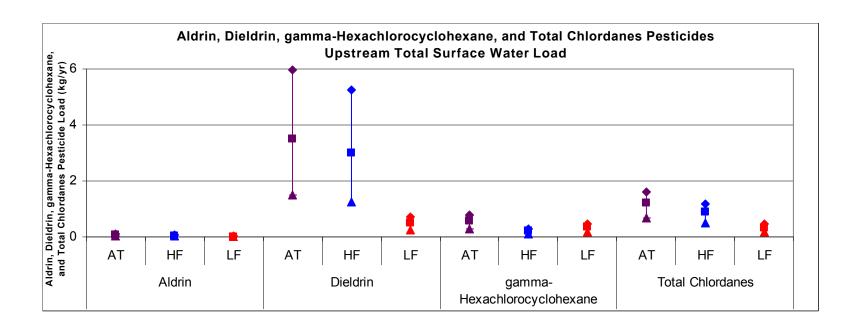


Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-11
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions
Bis(2-ethylhexyl)phthalate and Hexachlorobenzene – Upstream



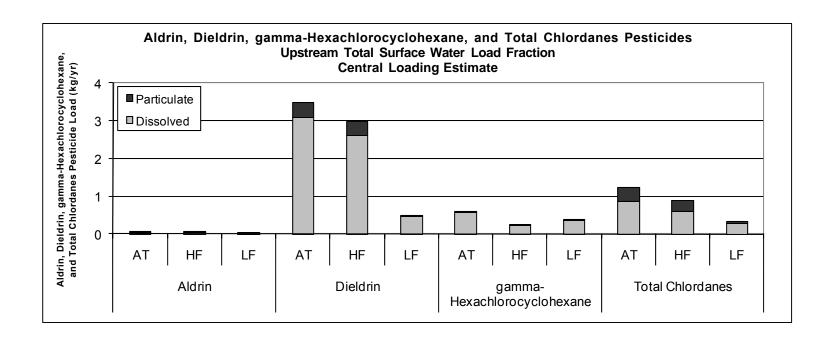
- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-12 Portland Harbor RI/FS Remedial Investigation Report Plot of Surface Water Loading Ranges Aldrin, Dieldrin, gamma-Hexachlorocyclohexane, and Total Chlordanes Pesticides – Upstream



Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-13
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions Aldrin,
Dieldrin, gamma-Hexachlorocyclohexane, and
Total Chlordanes Pesticides – Upstream

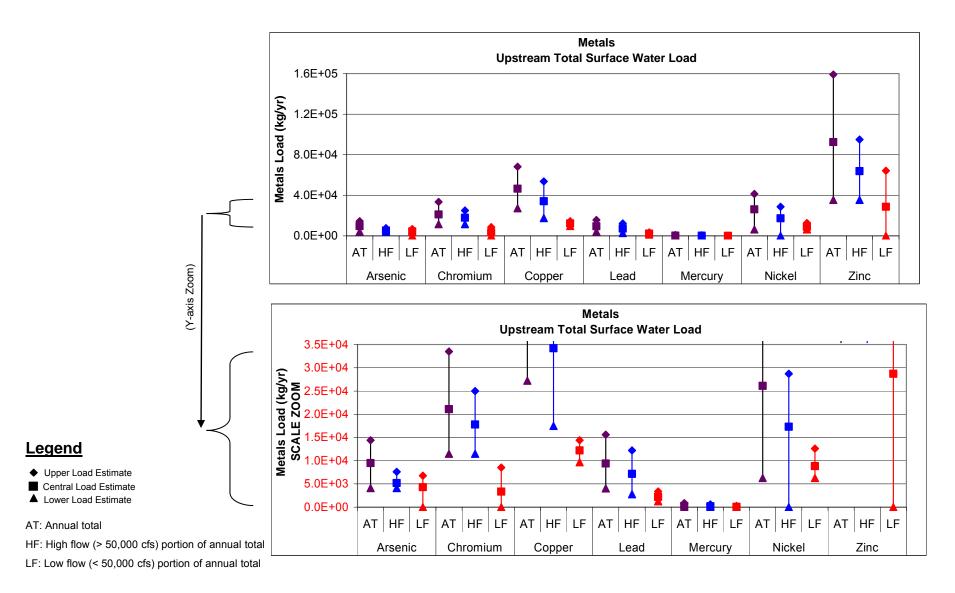
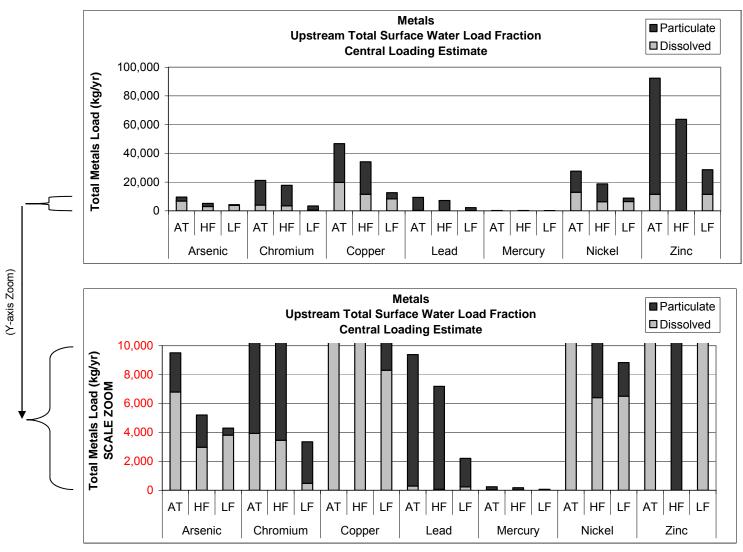


Figure 6.1-14
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Metals – Upstream



HF: High flow (> 50,000 cfs) portion of annual total LF: Low flow (< 50,000 cfs) portion of annual total

Notes

AT: Annual total

Figure 6.1-15
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
Metals – Upstream

- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

ND: Data below laboratory detection limit. Value set

equal to 0 prior to loading calculations

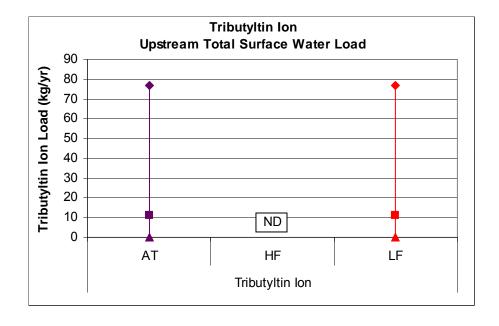


Figure 6.1-16
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Surface Water Loading Ranges
Tributyltin Ion – Upstream

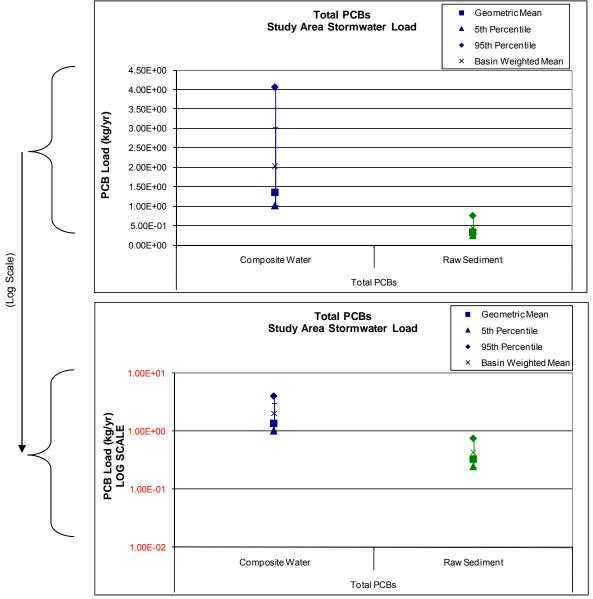


Figure 6.1-17
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PCBs

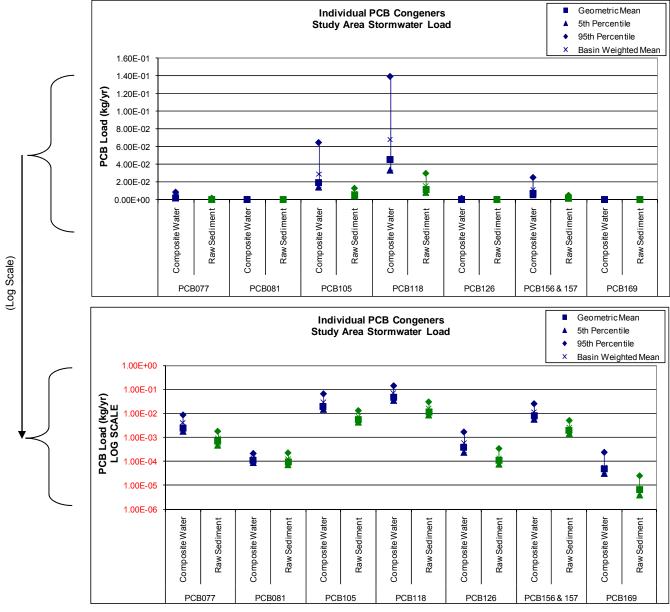


Figure 6.1-18
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Individual PCB Congeners

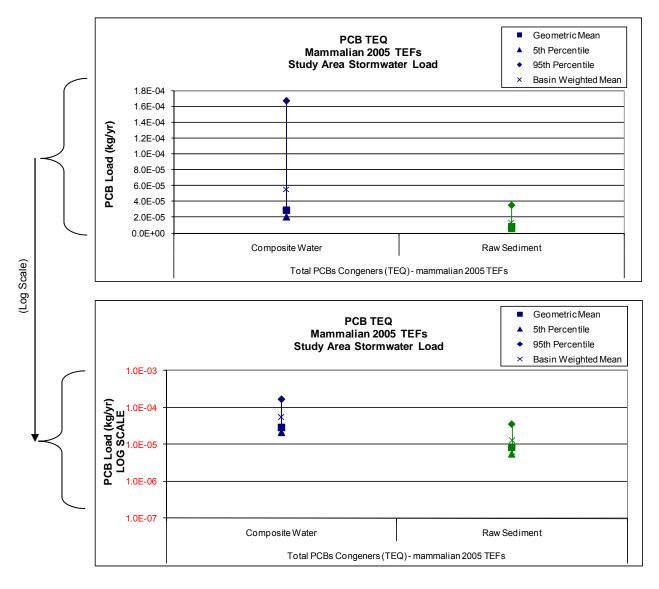
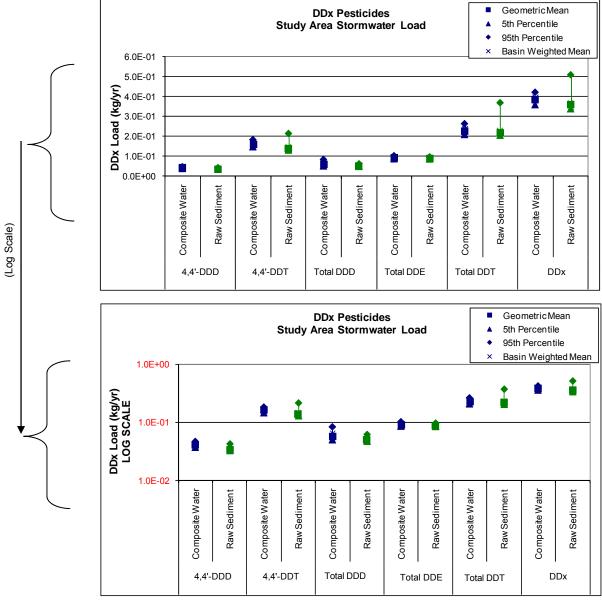
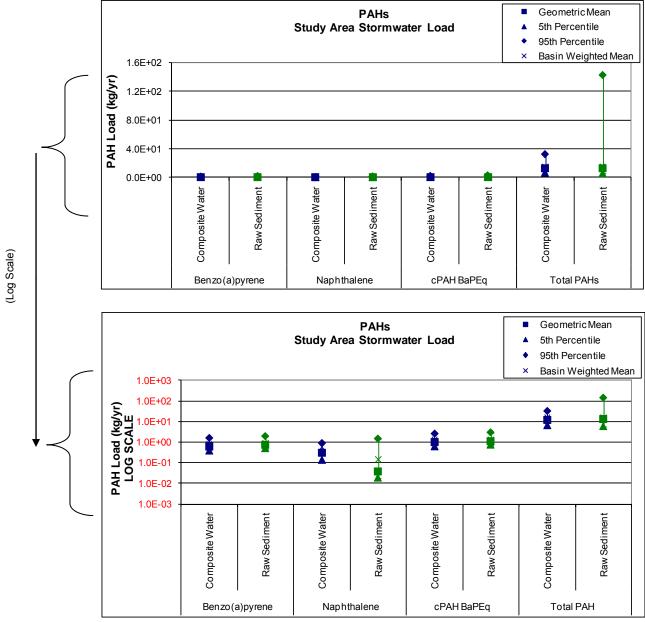


Figure 6.1-19
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
PCB TEQ



Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
DDx Pesticides



Plots of Stormwater Loading Ranges
PAHs

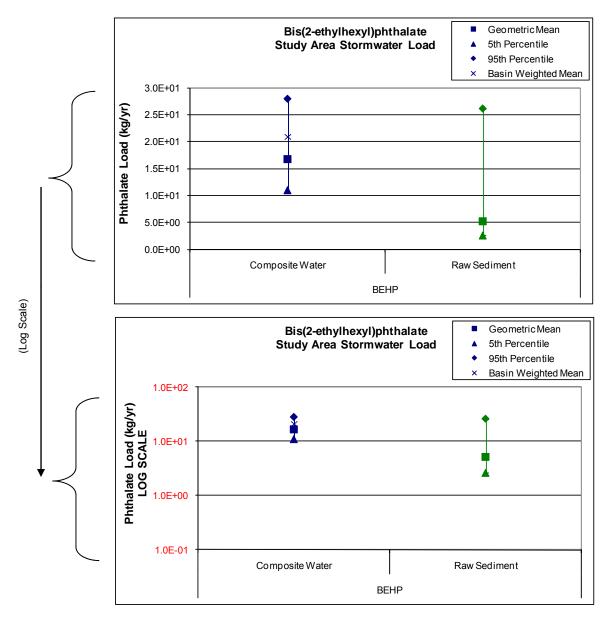


Figure 6.1-22
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Bis(2-ethylhexyl)phthalate

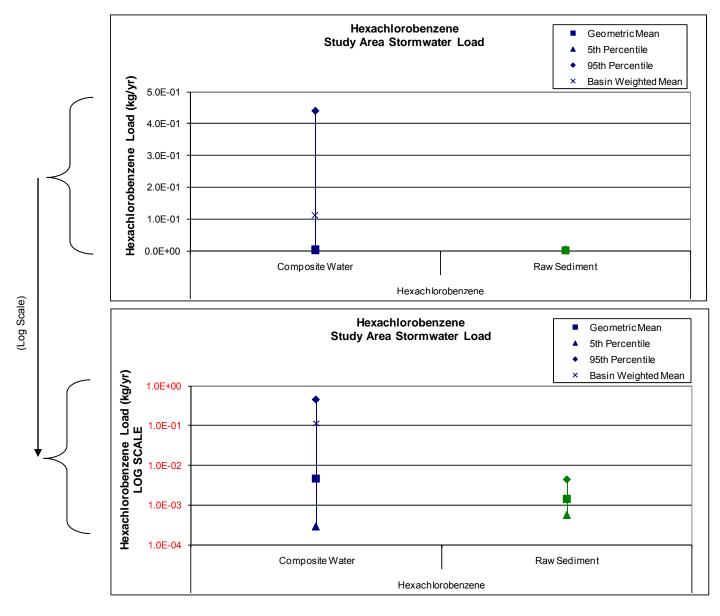
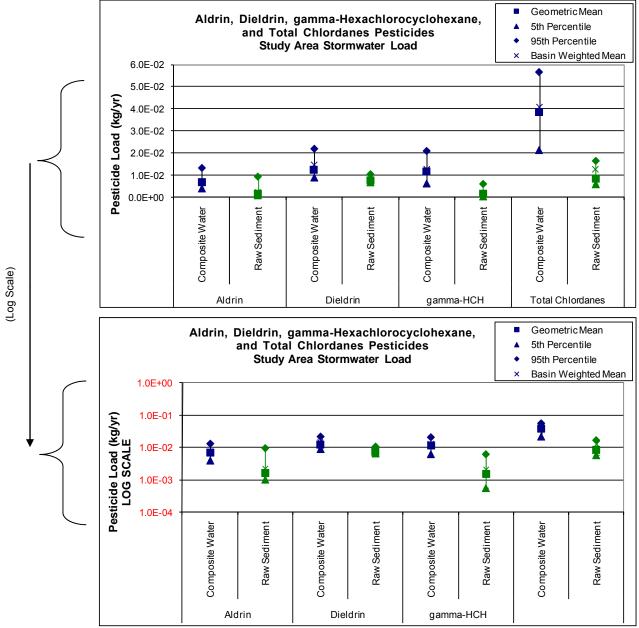


Figure 6.1-23
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Hexachlorobenzene



Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Aldrin, Dieldrin, gamma-Hexachlorocyclohexane,
and Total Chlordanes Pesticides

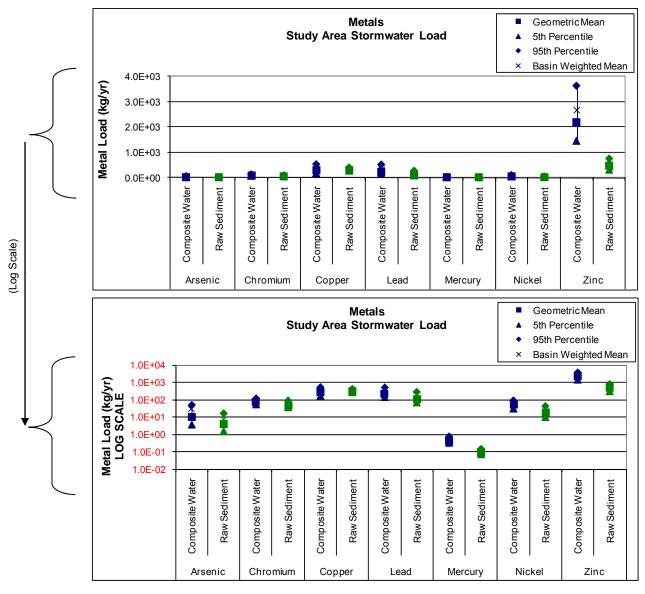
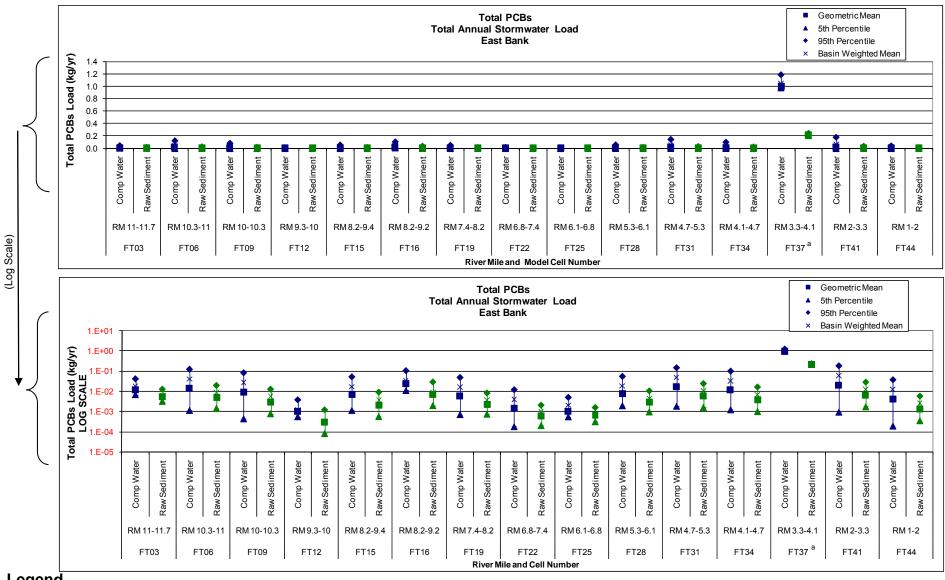


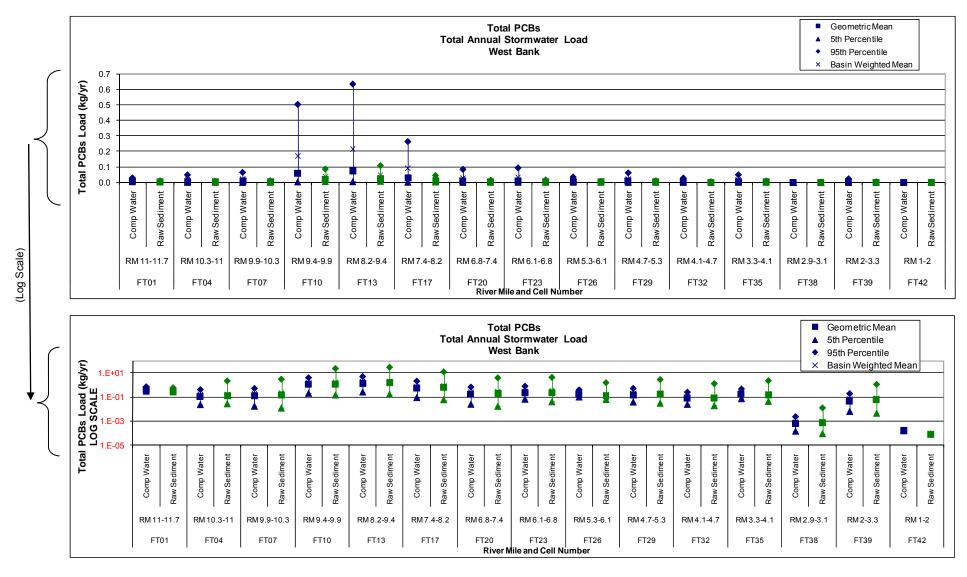
Figure 6.1-25
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Metals



Note:

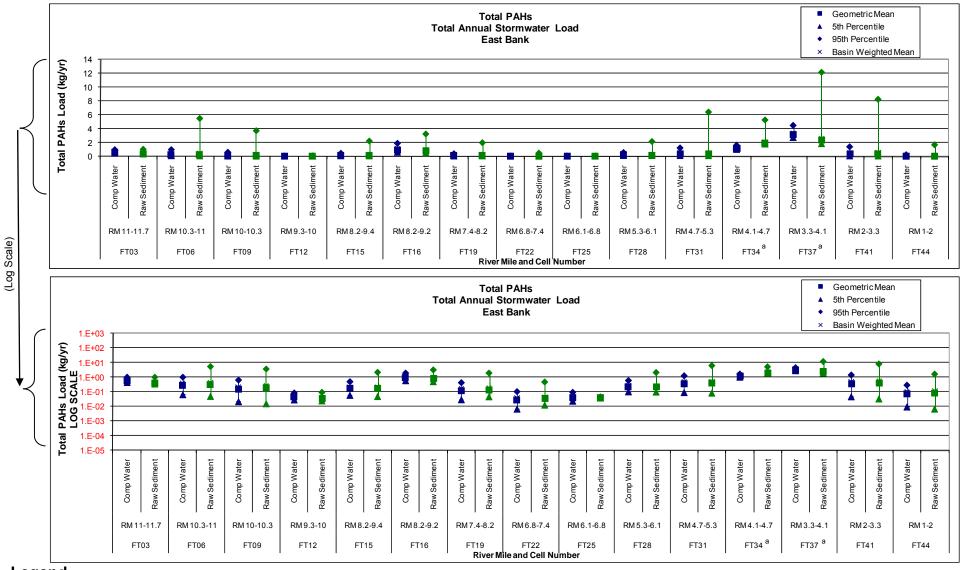
- Geometric Mean
- a Load estimate includes a non-representative site which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Figure 6.1-26 Portland Harbor RI/FS Remedial Investigation Report Plots of Stormwater Loading Ranges Total PCBs East Bank - River Mile Presentation



- Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Figure 6.1-27
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PCBs West Bank – River Mile Presentation



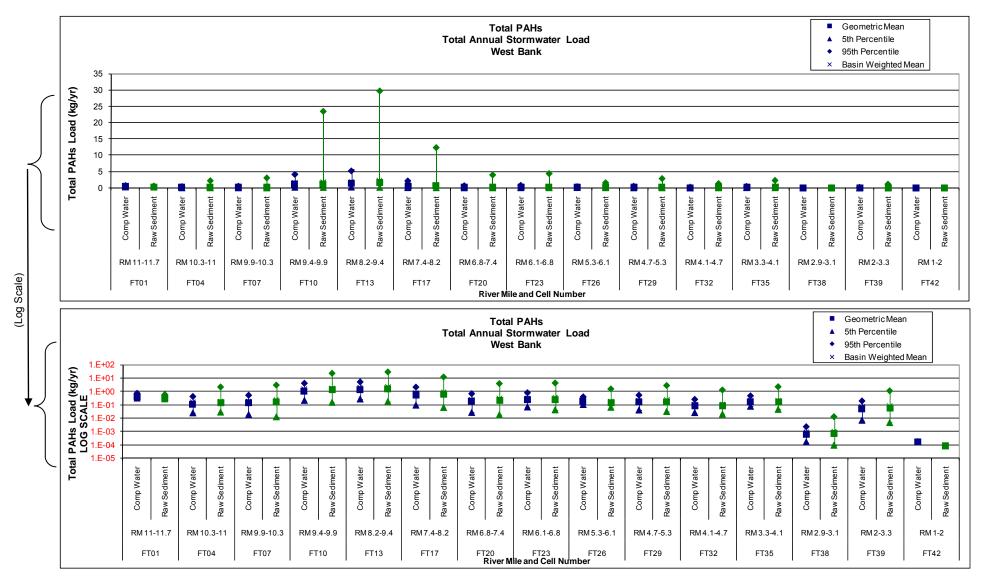
Note

a Load estimate includes a non-representative site which may lead to increased uncertainty related to the stormwater sampling program

■ Geometric Mean and load calculation methods (see Section 6.1.2.2).

- ♦ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

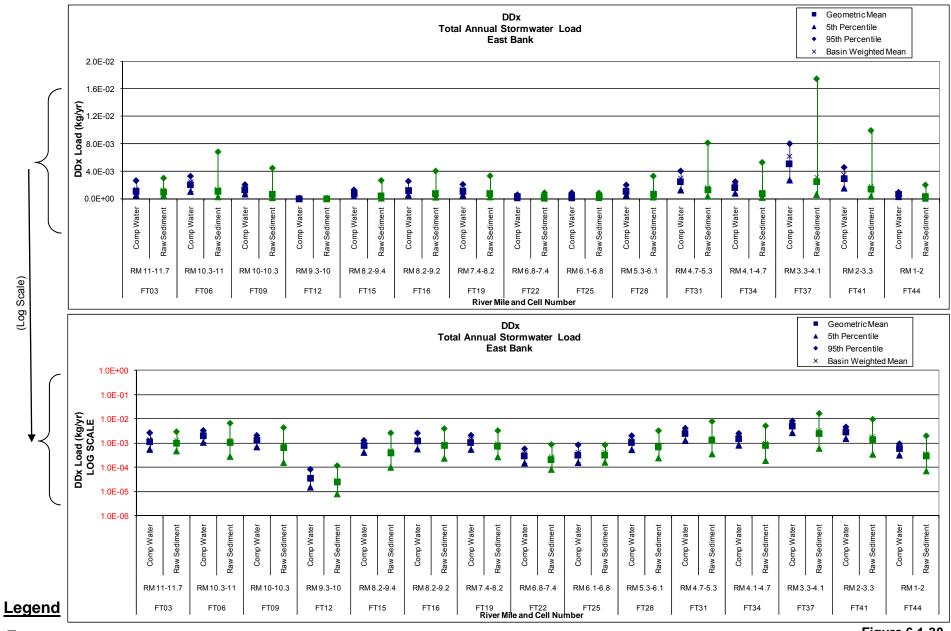
Figure 6.1-28
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PAHs East Bank – River Mile Presentation



- Geometric Mean
- ♦ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Figure 6.1-29 Portland Harbor RI/FS

Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PAHs West Bank – River Mile Presentation



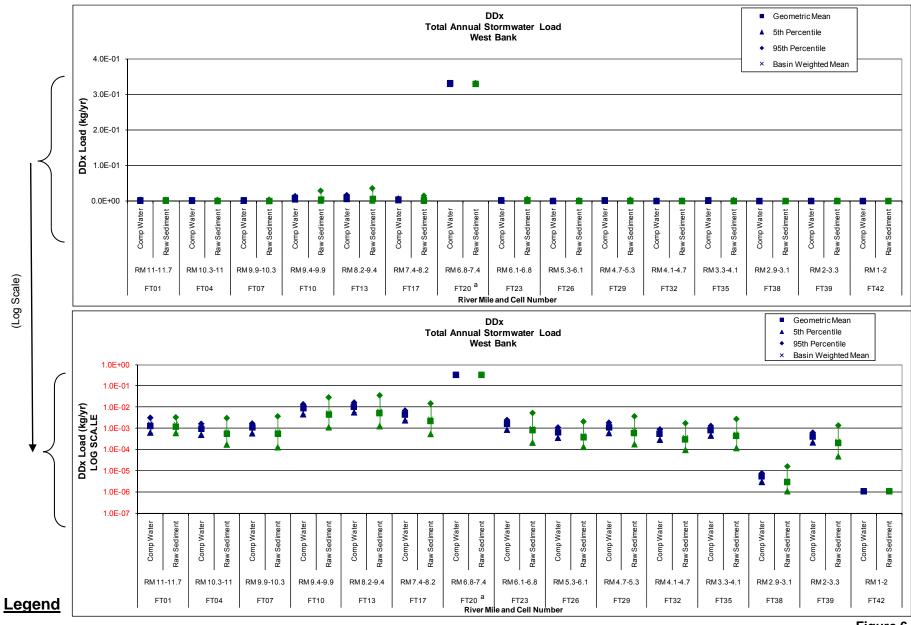
Geometric Mean

Figure 6.1-30
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
DDx East Bank – River Mile Presentation

^{♦ 95&}lt;sup>th</sup> Percentile

^{▲ 5&}lt;sup>th</sup> Percentile

X Basin Weighted Mean



Geometric Mean

◆ 95th Percentile

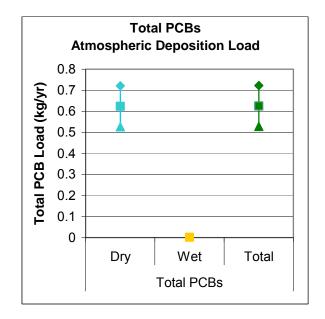
▲ 5th Percentile

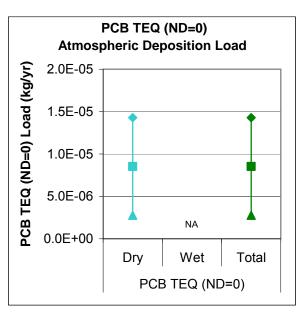
x Basin Weighted Mean

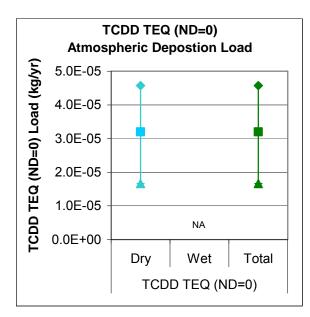
Note:

^a Load estimate includes non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

Figure 6.1-31
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
DDx West Bank – River Mile Presentation



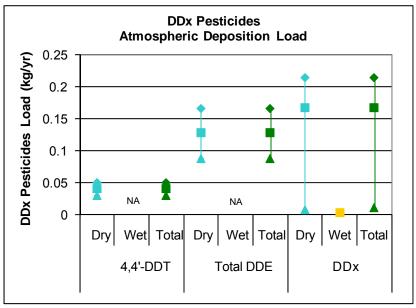


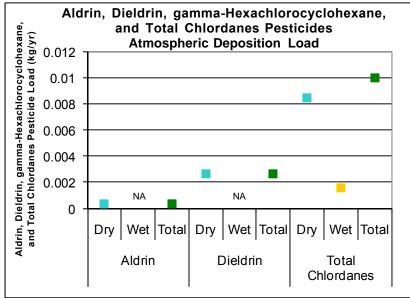


- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-32
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
PCBs and TCDD TEQ (ND=0) – Study Area





- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-33
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
DDx and Aldrin, Dieldrin, gamma-Hexachlorocyclohexane,
and Total Chlordanes Pesticides – Study Area

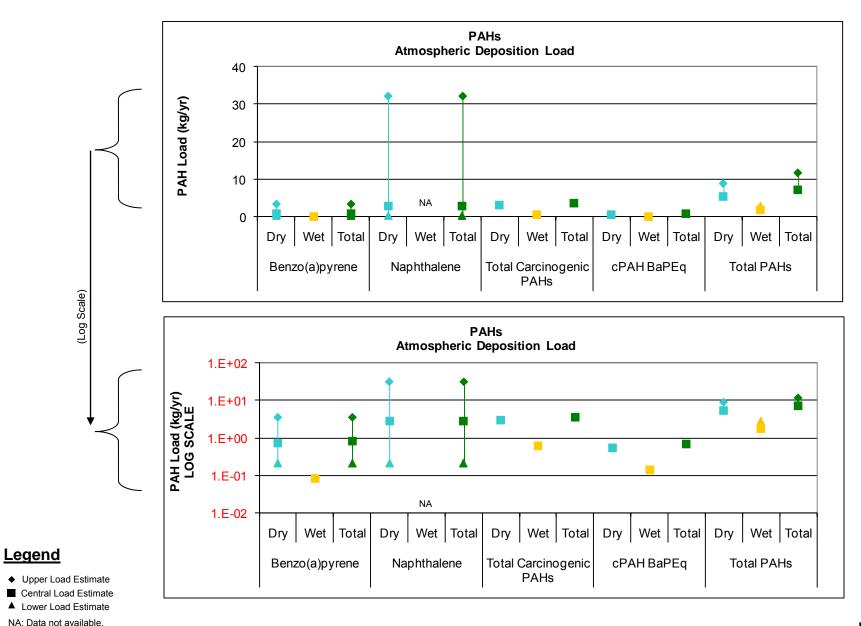
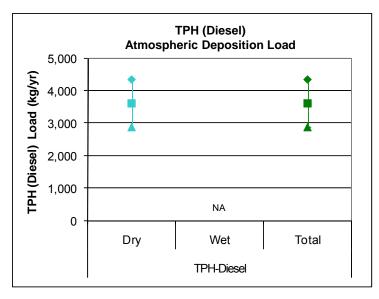
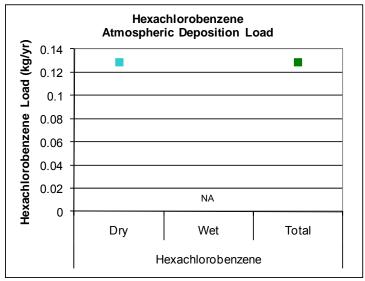


Figure 6.1-34
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
PAHs – Study Area





- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-35
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
TPH (Diesel) and Hexachlorobenzene – Study Area

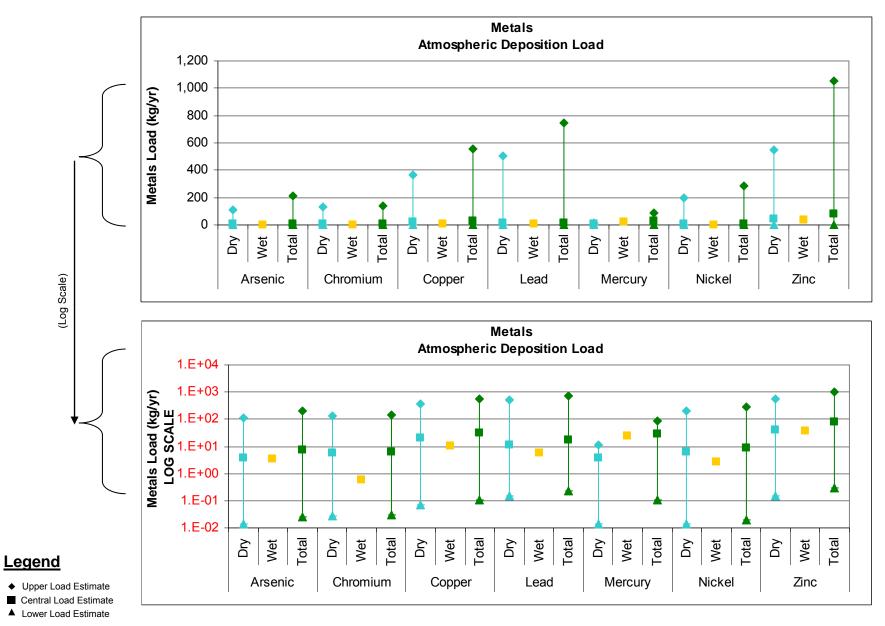
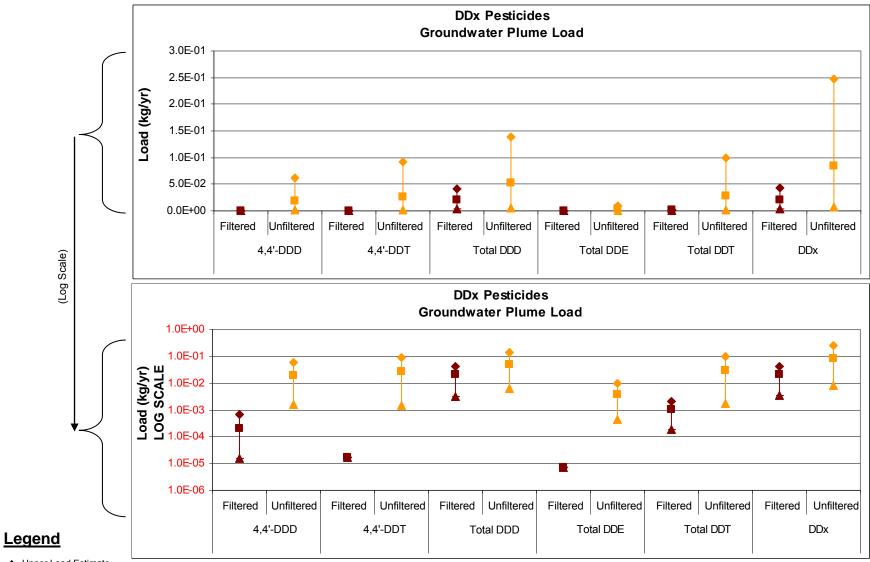


Figure 6.1-36
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
Metals – Study Area



- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

Note:

Unfiltered pesticide results are likely biased high due to entrainment of sediments in the TZW samples.

Figure 6.1-37
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
DDx Pesticides – Entire Study Area

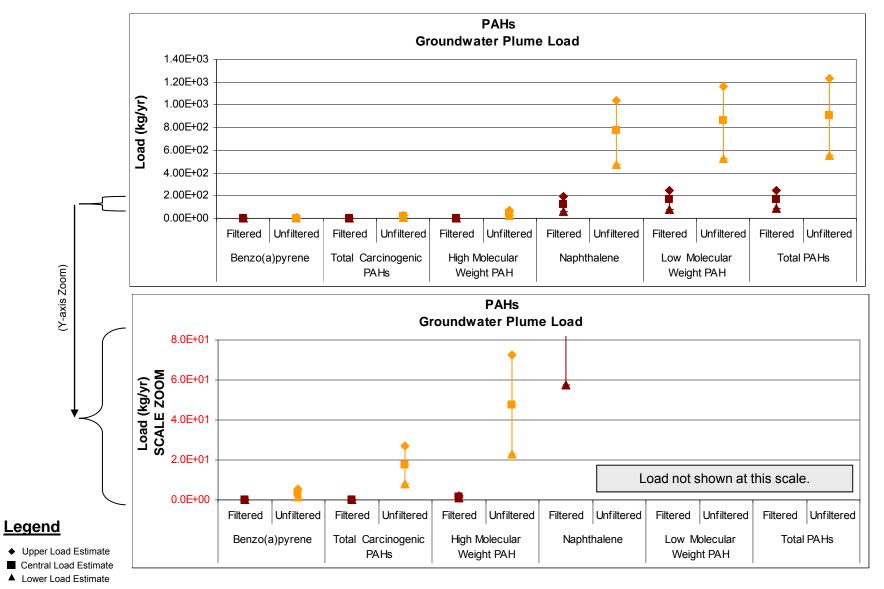


Figure 6.1-38
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
PAHs – Entire Study Area

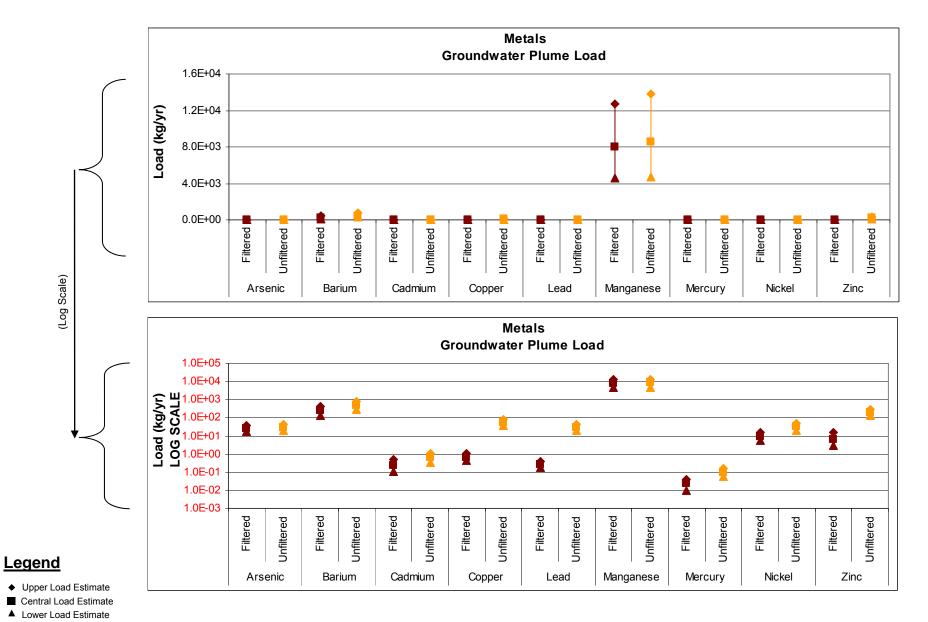


Figure 6.1-39
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
Metals – Entire Study Area

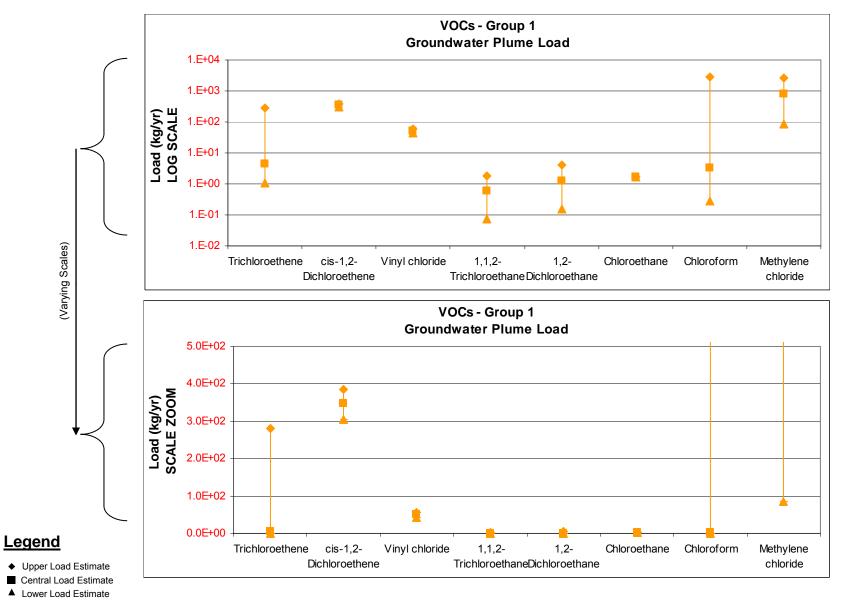


Figure 6.1-40
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
VOCs (Group 1) – Entire Study Area

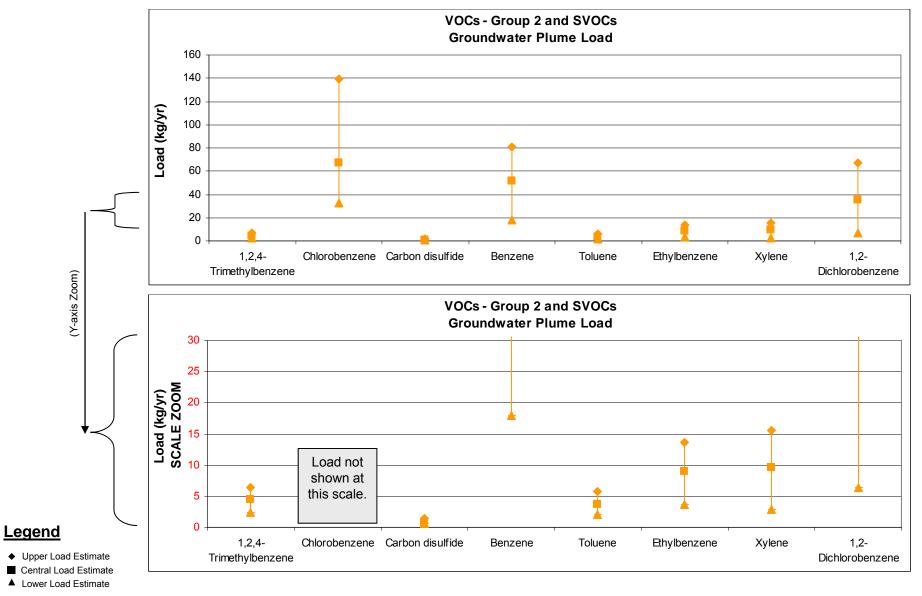
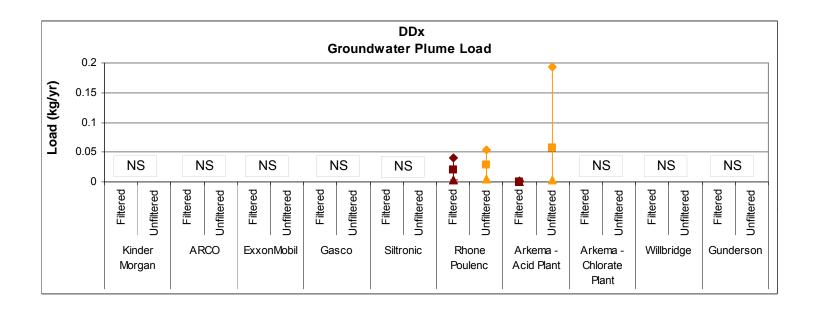


Figure 6.1-41
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
VOCs (Group 2) and SVOCs – Entire Study Area



- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

NS: Not Sampled.

Note

Unfiltered pesticide results are likely biased high due to entrainment of sediments in the TZW samples.

Figure 6.1-42
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Groundwater Plume Loading Ranges
DDx – Upland Area Presentation

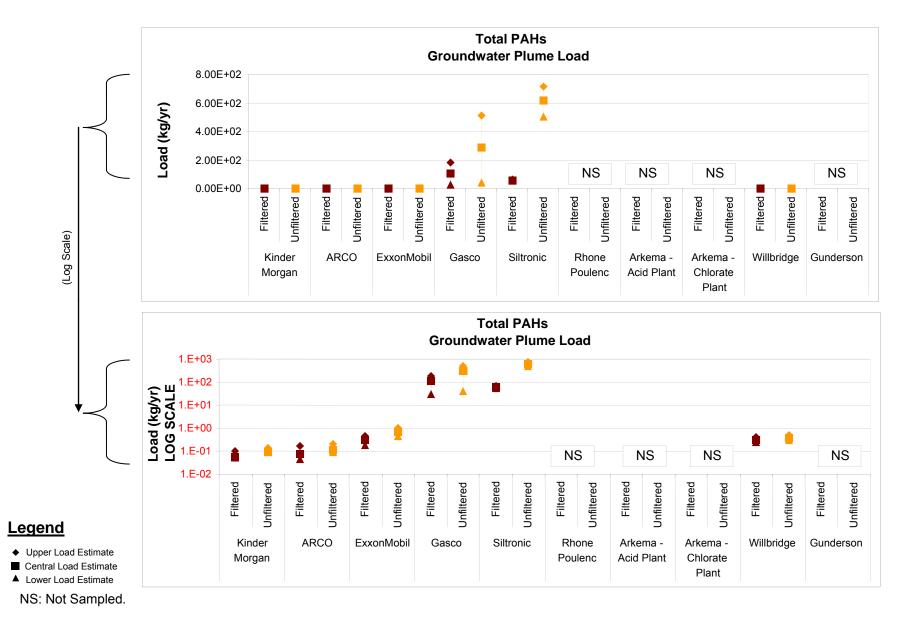


Figure 6.1-43
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
Total PAHs – Upland Area Presentation

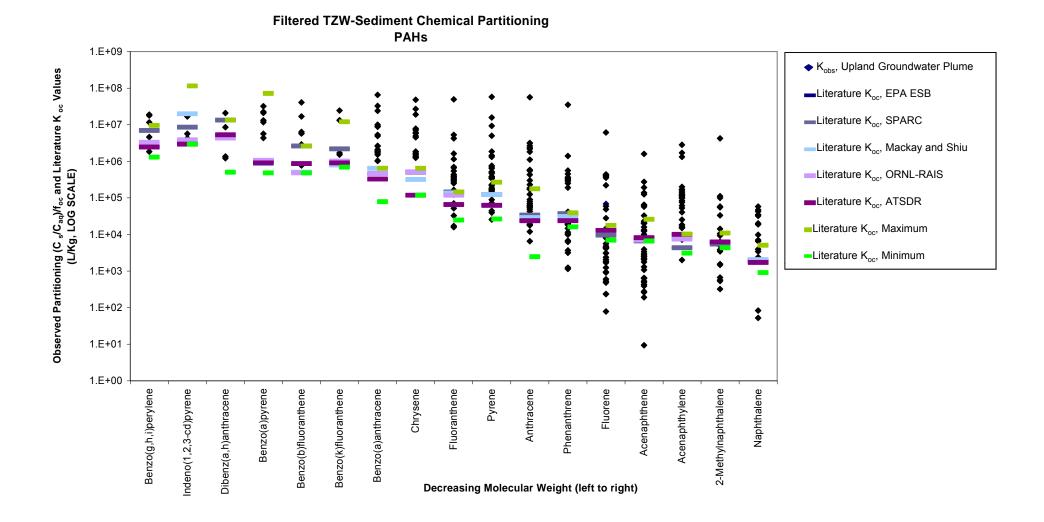


Figure 6.2-1
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
PAHs

Filtered TZW-Sediment Chemical Partitioning DDx Pesticides

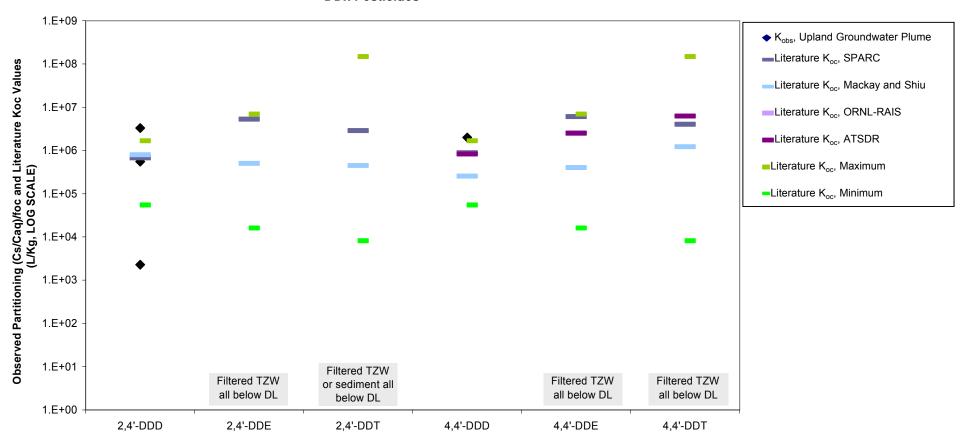


Figure 6.2-2
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
DDx Pesticides

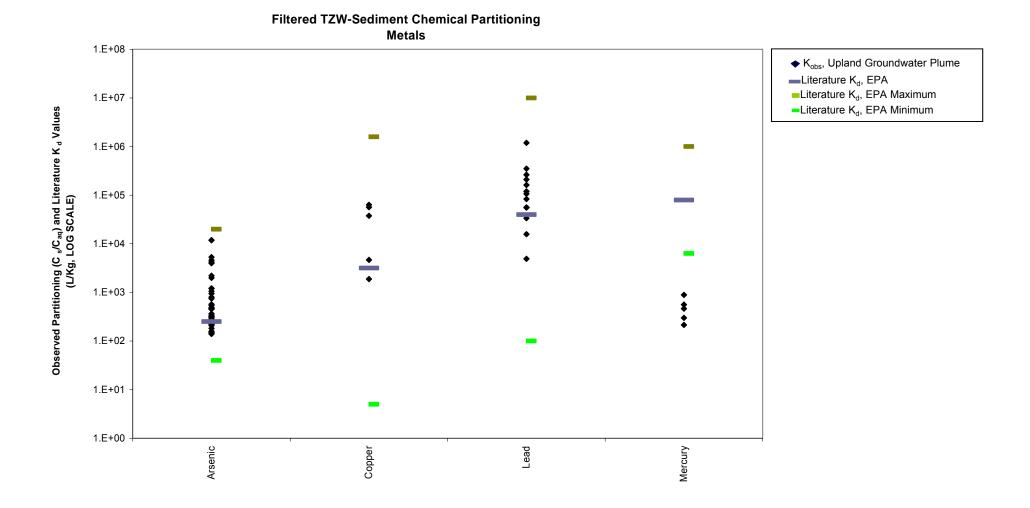
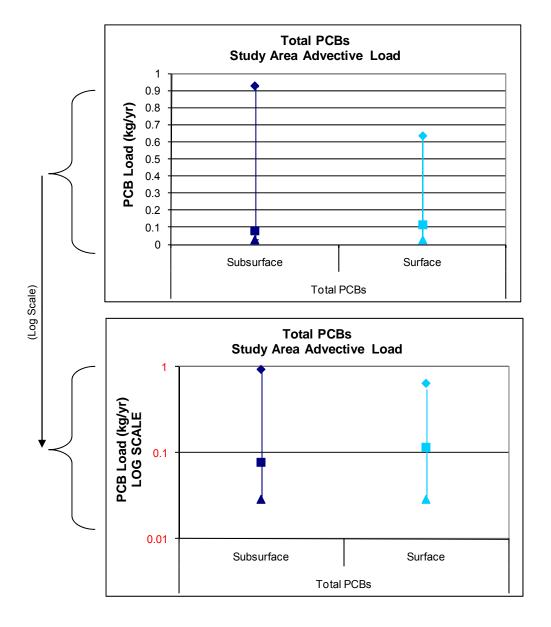
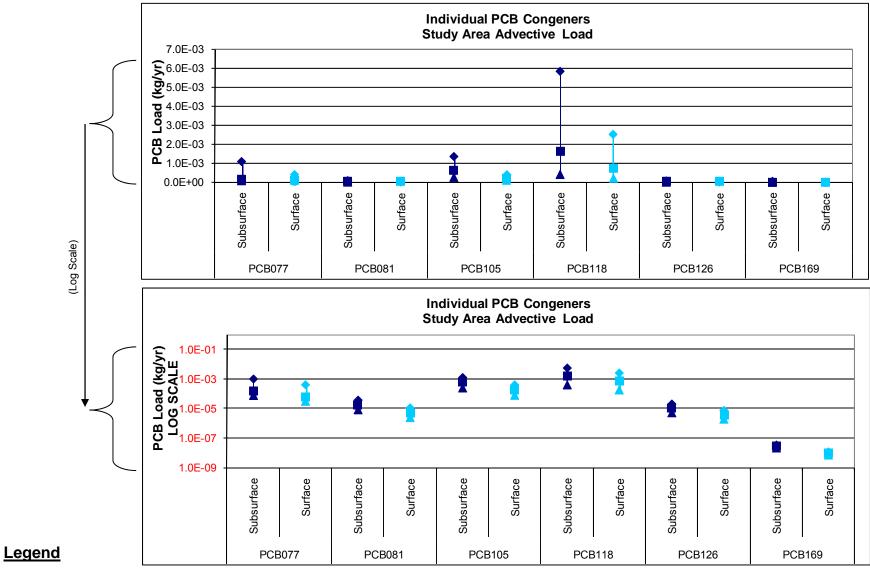


Figure 6.2-3
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
Metals



- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.2-4
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PCBs – Entire Study Area

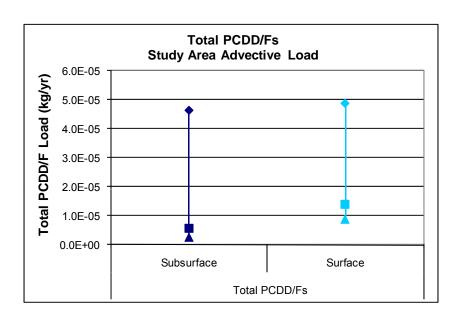


◆ Upper Load Estimate

▲ Lower Load Estimate

Figure 6.2-5
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Individual PCB Congeners – Entire Study Area

Central Load Estimate



- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.2-6

Portland Harbor RI/FS Remedial Investigation Report Plot of Advective Loading Ranges Total PCDD/Fs – Entire Study Area

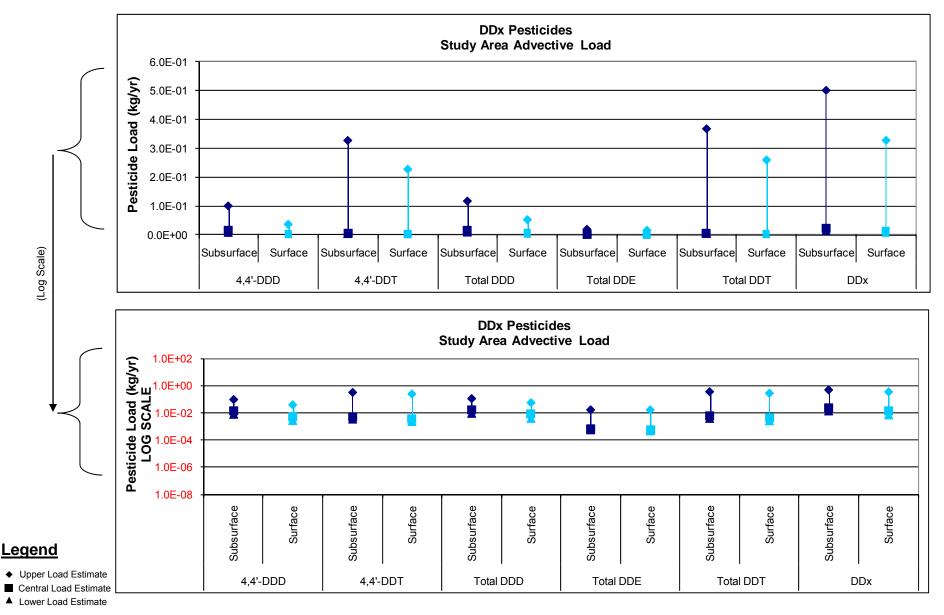


Figure 6.2-7
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
DDx Pesticides – Entire Study Area

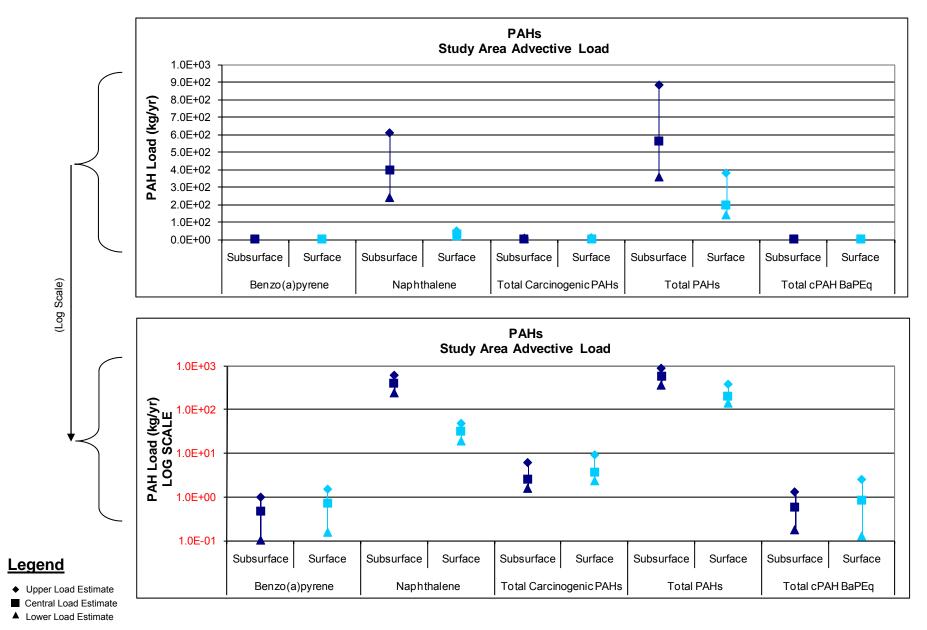
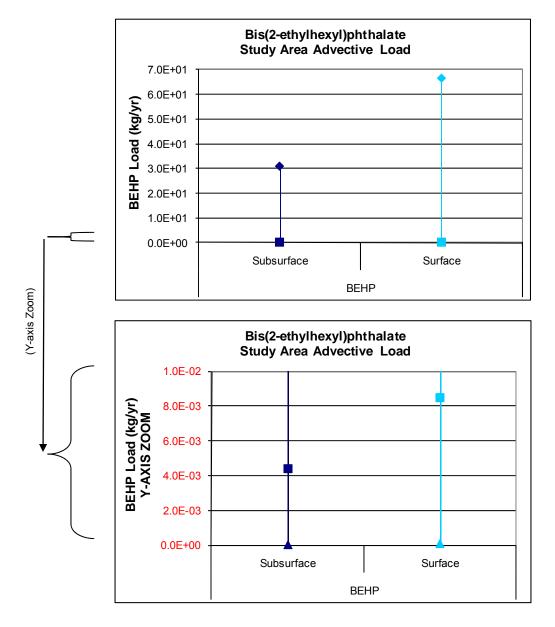


Figure 6.2-8
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
PAHs – Entire Study Area



- Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.2-9
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Bis(2-ethylhexyl)phthalate – Entire Study Area

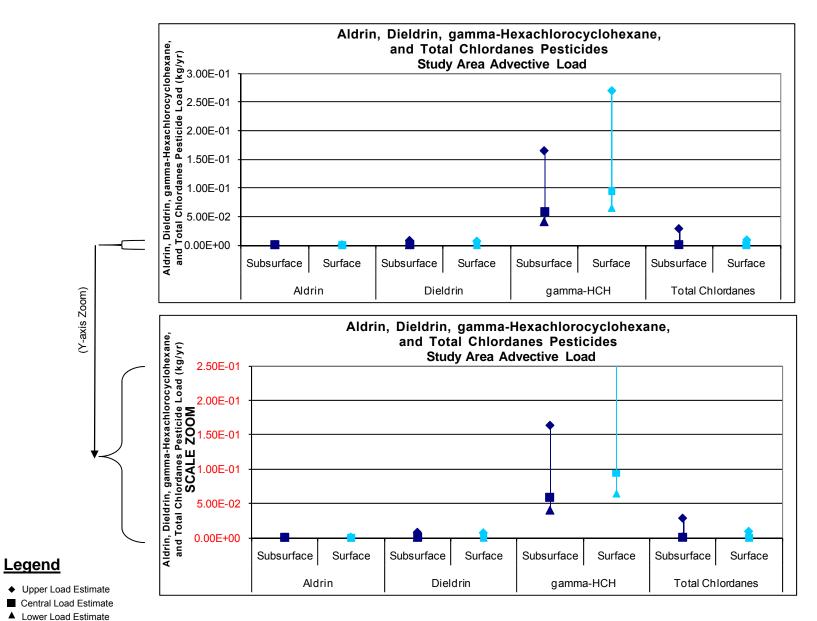


Figure 6.2-10
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Aldrin, Dieldrin, gamma-Hexachlorocyclohexane, and
Total Chlordanes Pesticides – Entire Study Area

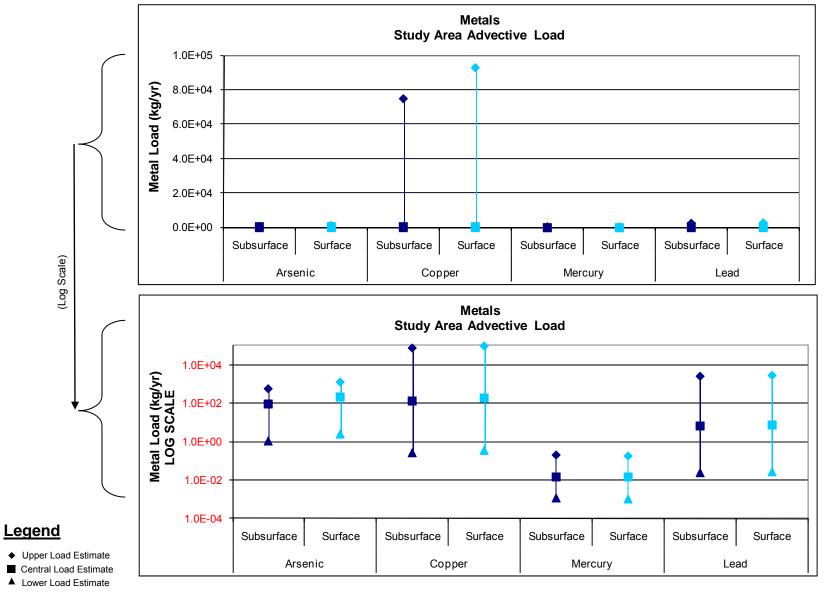
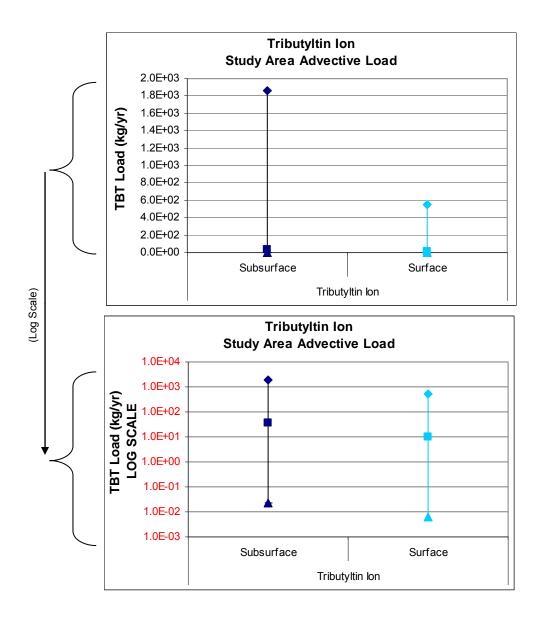
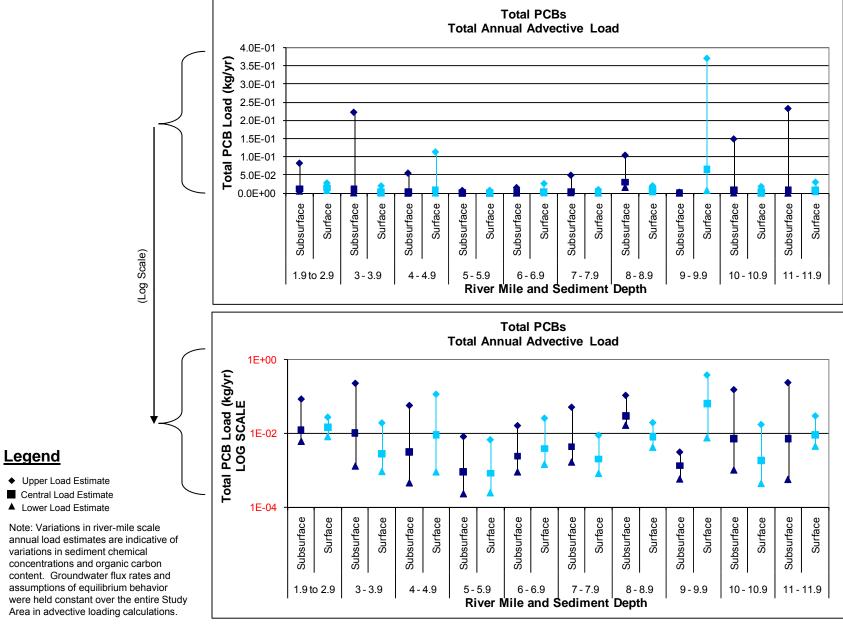


Figure 6.2-11
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Metals – Entire Study Area

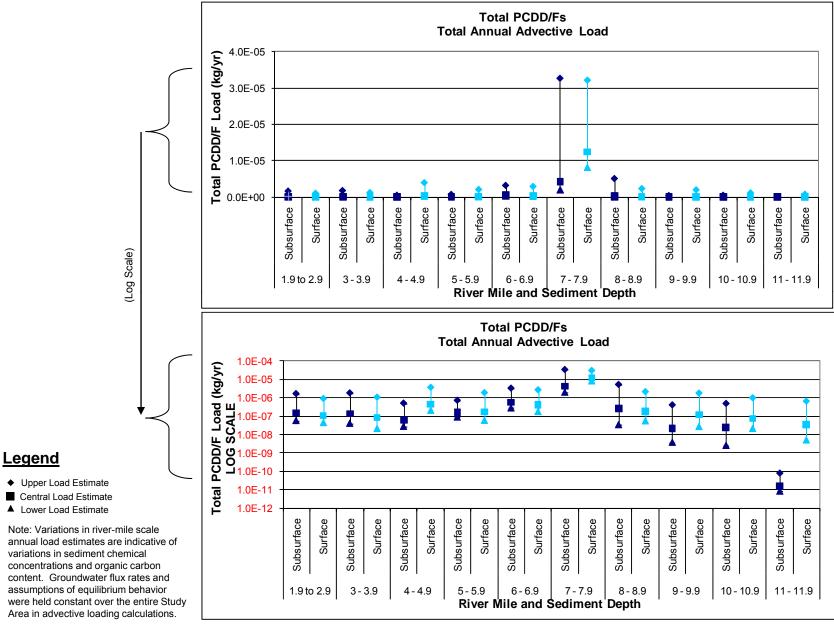


- ◆ Upper Load Estimate
- Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.2-12
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Tributylin Ion – Entire Study Area



Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PCBs – River Mile Presentation



Portland Harbor RI/FS Remedial Investigation Report Plots of Advective Loading Ranges

Figure 6.2-14

Total PCDD/Fs – River Mile Presentation

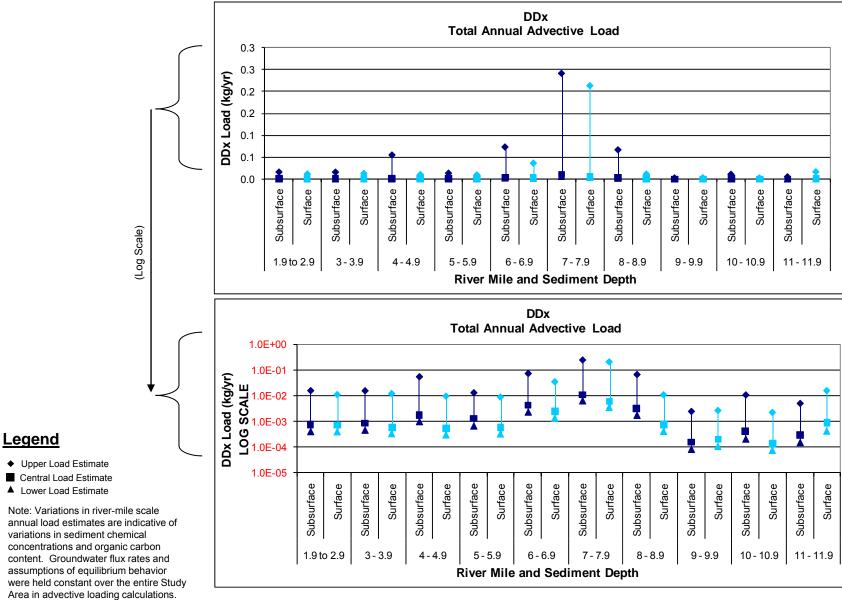
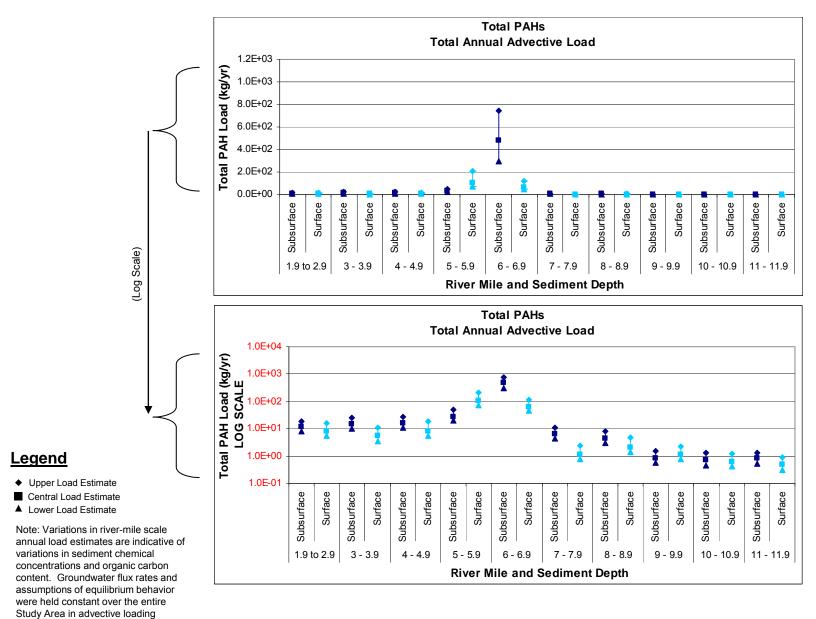


Figure 6.2-15
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
DDx – River Mile Presentation



calculations.

Figure 6.2-16
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PAHs – River Mile Presentation

Filtered Surface Water to Suspended Sediment Partitioning PAHs

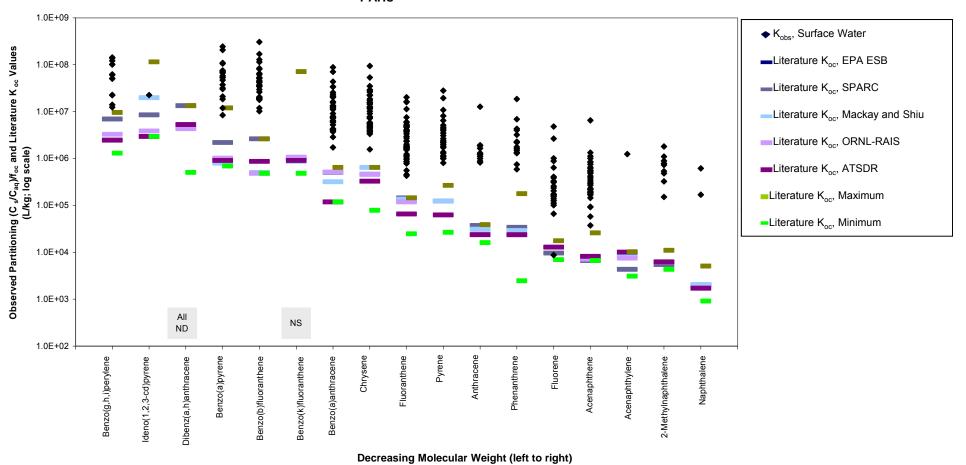


Figure 6.2-17
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PAHs

Filtered Surface Water to Suspended Sediment Partitioning DDx Pesticides

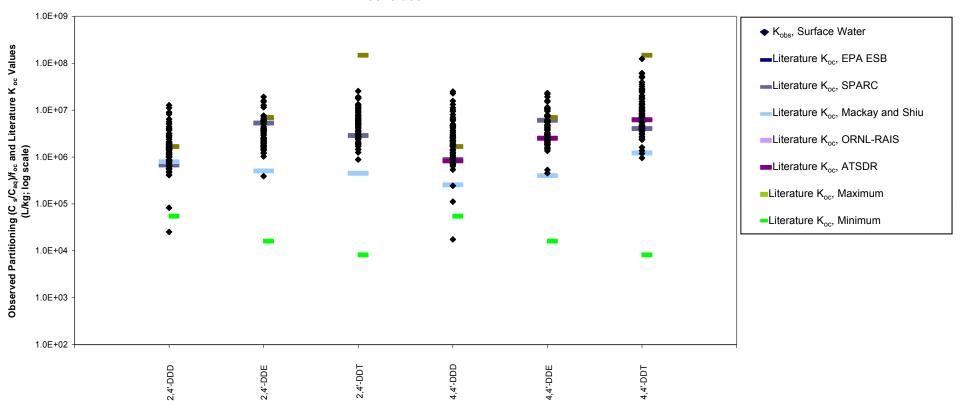


Figure 6.2-18
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
DDx Pesticides

Filtered Surface Water to Suspended Sediment Partitioning Dioxin/Furans

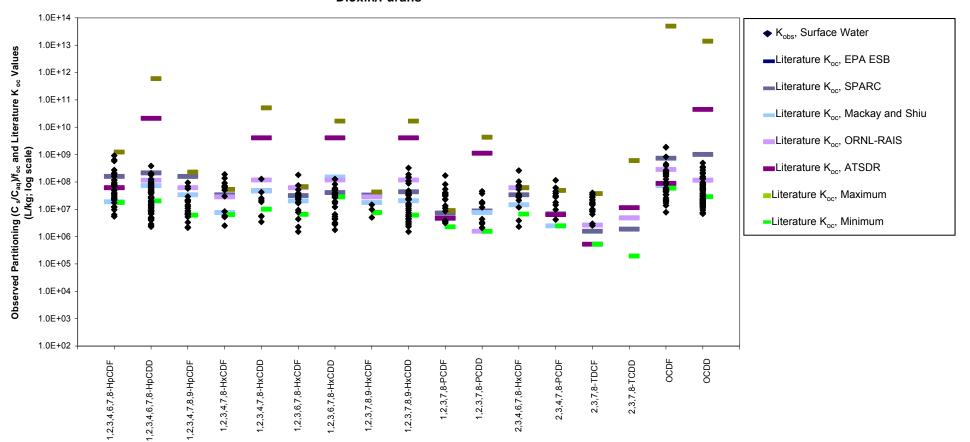


Figure 6.2-19
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PCDD/Fs

Filtered Surface Water to Suspended Sediment Partitioning PCB Homolog Groups

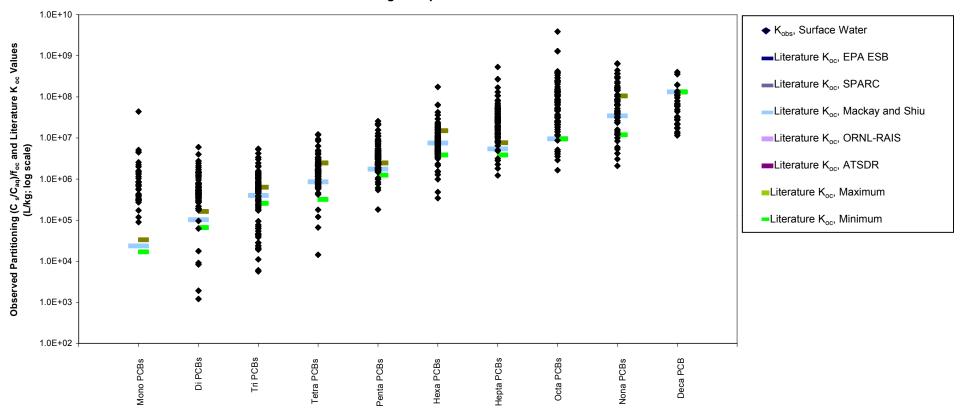


Figure 6.2-20
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PCB Homologs

Filtered Surface Water to Suspended Sediment Partitioning cis-Chlordane, trans-Chlordane, Oxychlordane, cis-Nonachlor, trans-Nonachlor, Aldrin, Dieldrin, and gamma-Hexachlorocyclohexane Pesticides

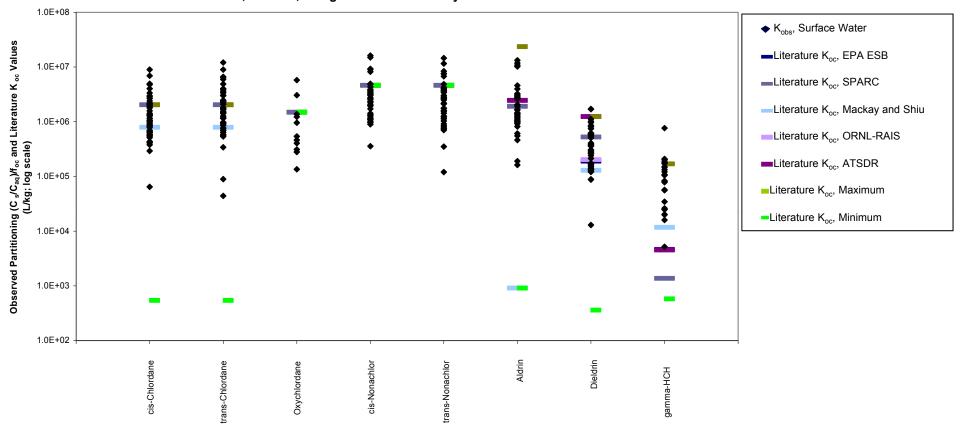


Figure 6.2-21
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water
and Suspended Sediment Partitioning
cis-Chlordane, trans-Chlordane, Oxychlordane,
cis-Nonachlor, trans-Nonachlor, Aldrin, Dieldrin, and
gamma-Hexachlorocyclohexane Pesticides

Filtered Surface Water to Suspended Sediment Partitioning Metals

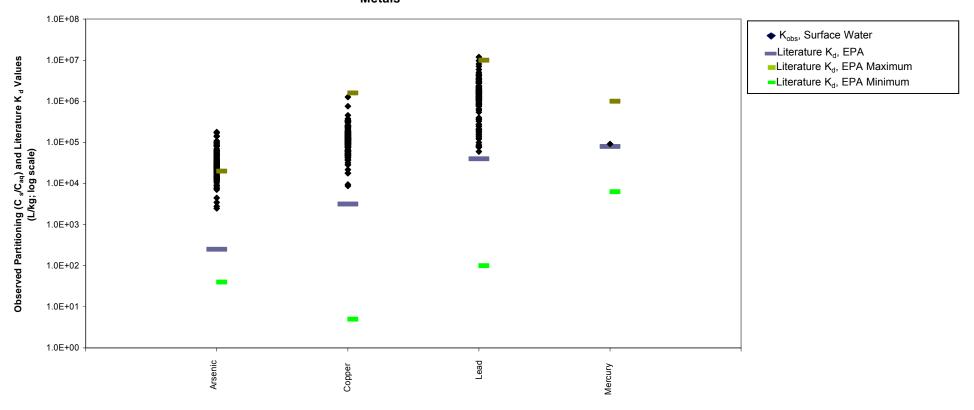
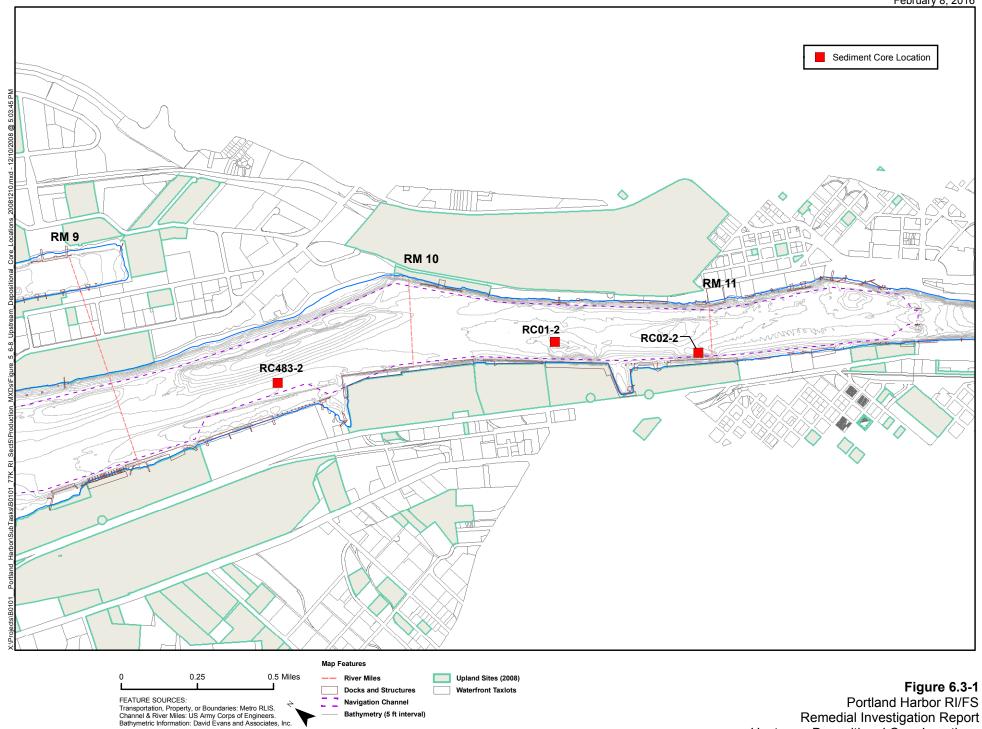
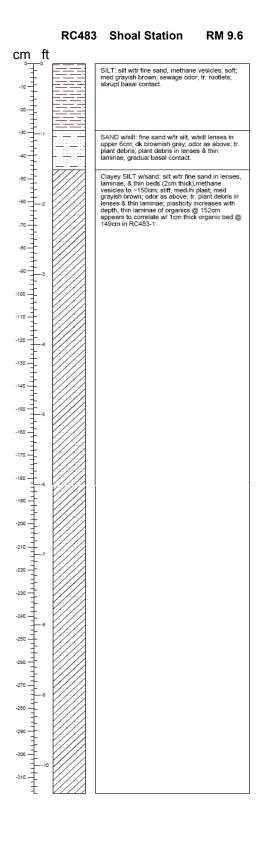
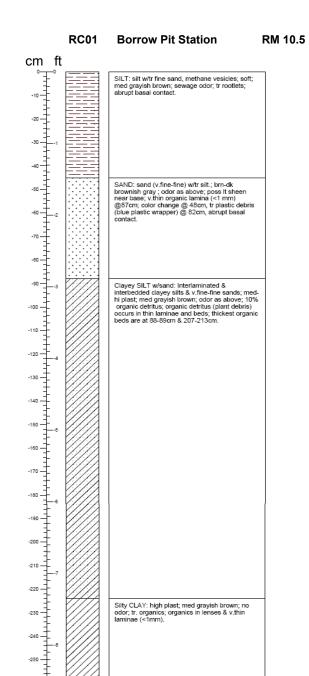


Figure 6.2-22
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
Metals



Remedial Investigation Report Upstream Depositional Core Locations





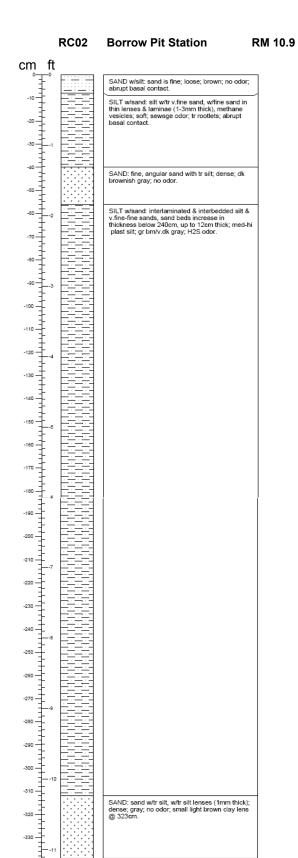


Figure 6.3-2
Portland Harbor RI/FS
Remedial Investigation Report
Core Logs for the RC483-2, RC01-2, RC02-1

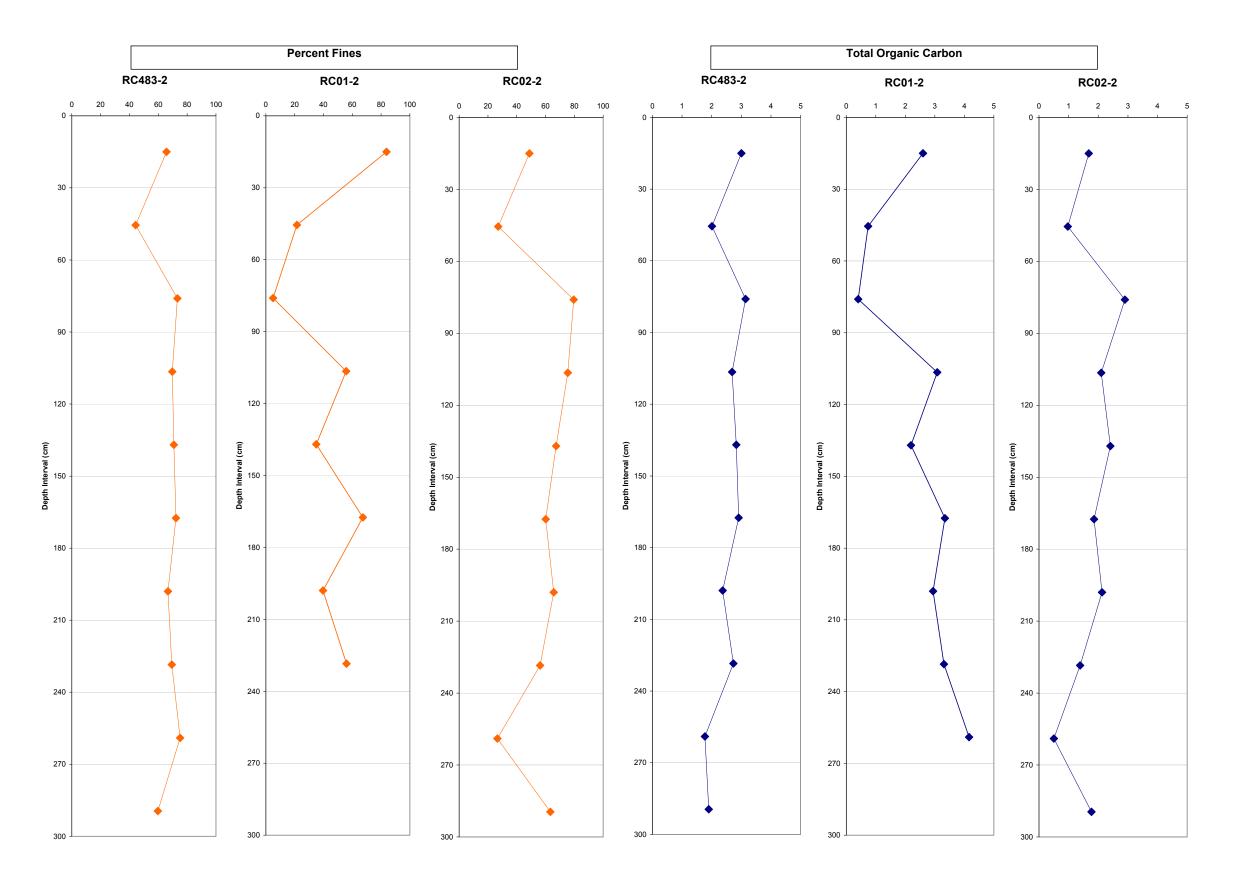


Figure 6.3-3
Portland Harbor RI/FS
Remedial Investigation Report
Grain Size and TOC Plots for RC483-2, RC01-2, RC02-1

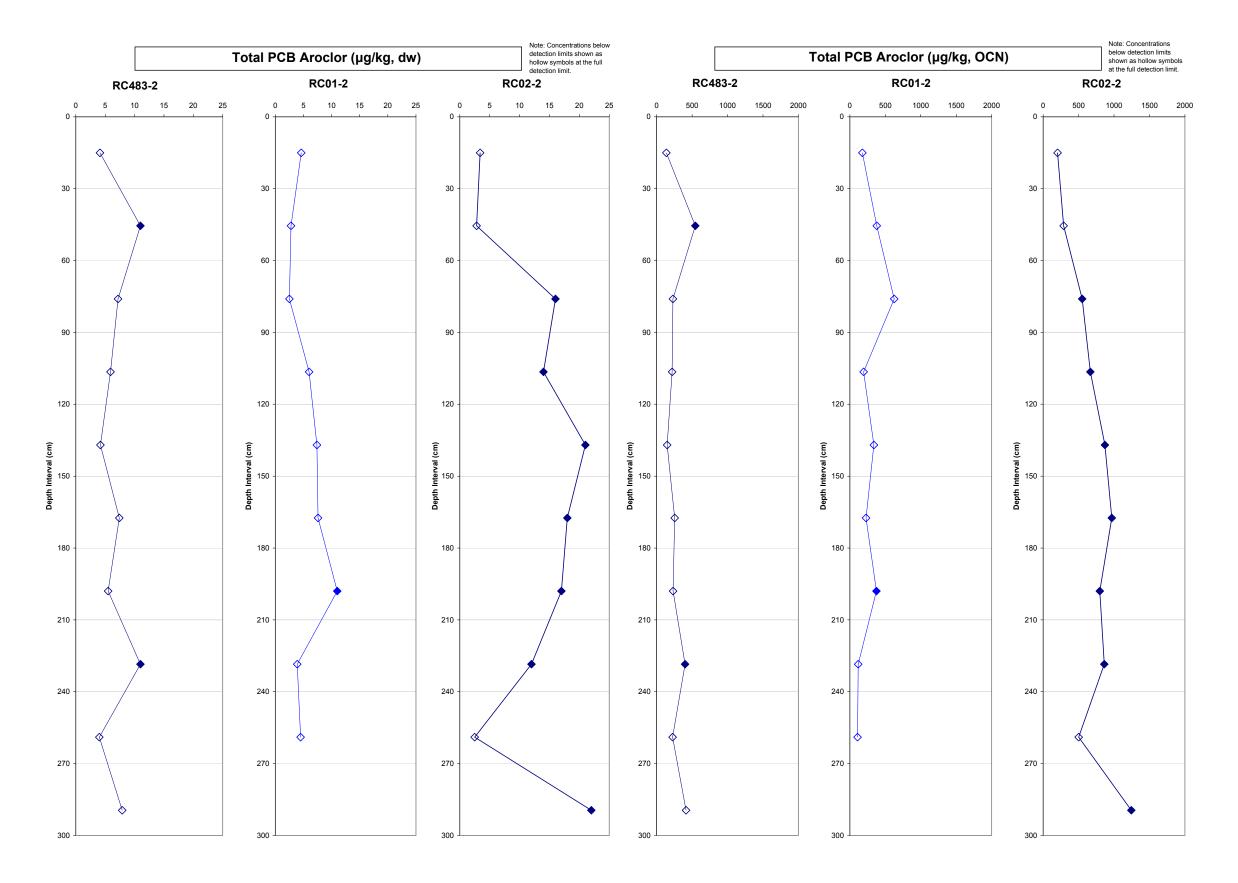


Figure 6.3-4
Portland Harbor RI/FS
Remedial Investigation Report
Total PCB Plots for RC483-2, RC01-2, RC02-1

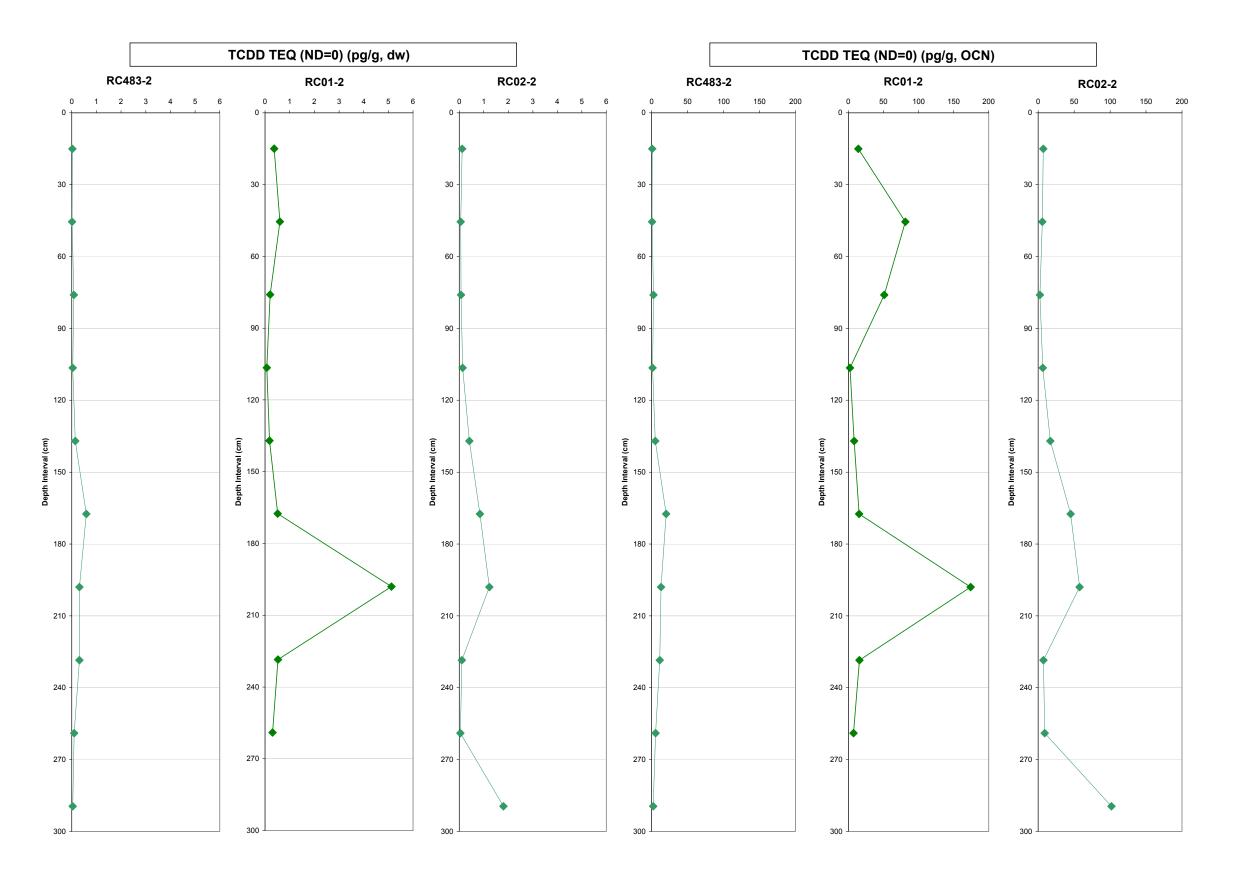


Figure 6.3-5
Portland Harbor RI/FS
Remedial Investigation Report
TCDD TEQ (ND=0) Plots for RC483-2, RC01-2, RC02-1

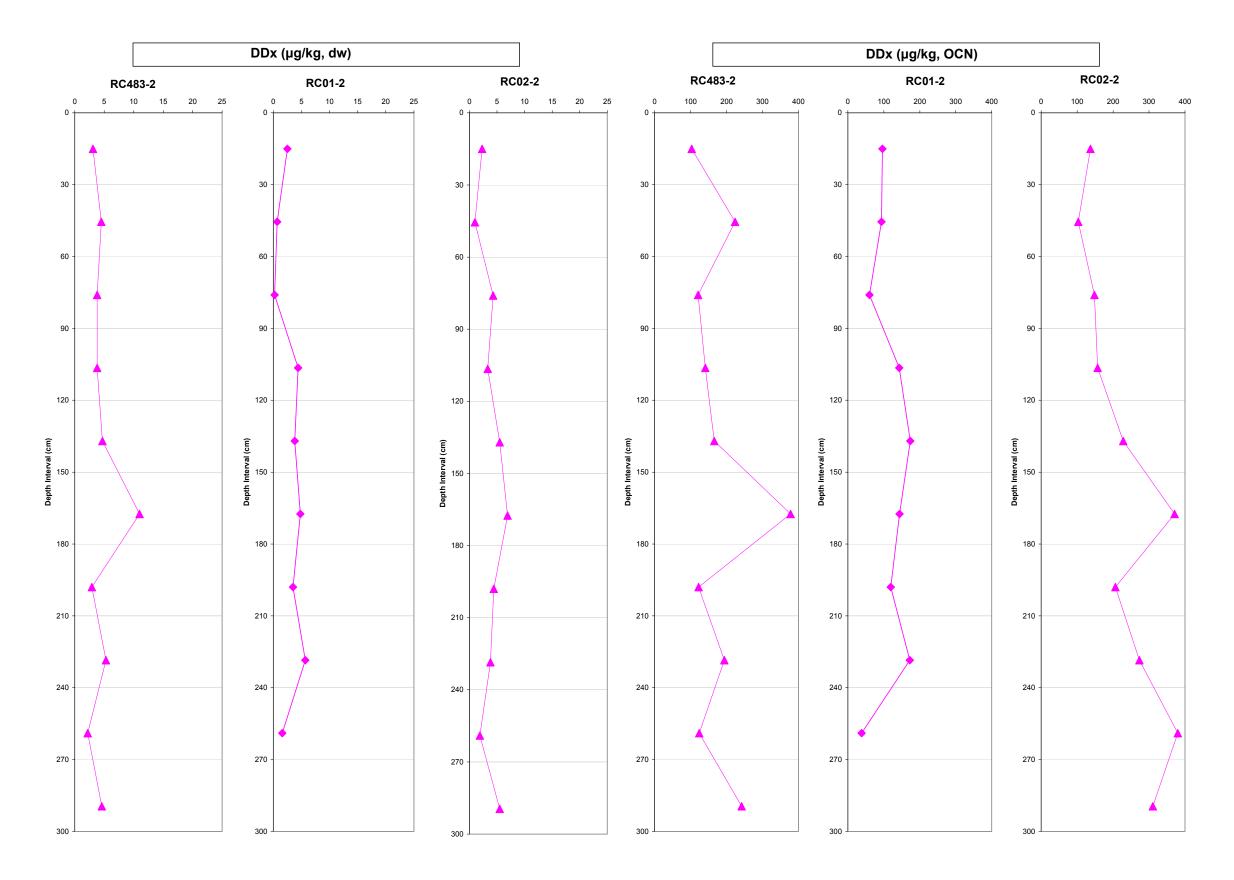


Figure 6.3-6
Portland Harbor RI/FS
Remedial Investigation Report
DDx Plots for RC483-2, RC01-2, RC02-1

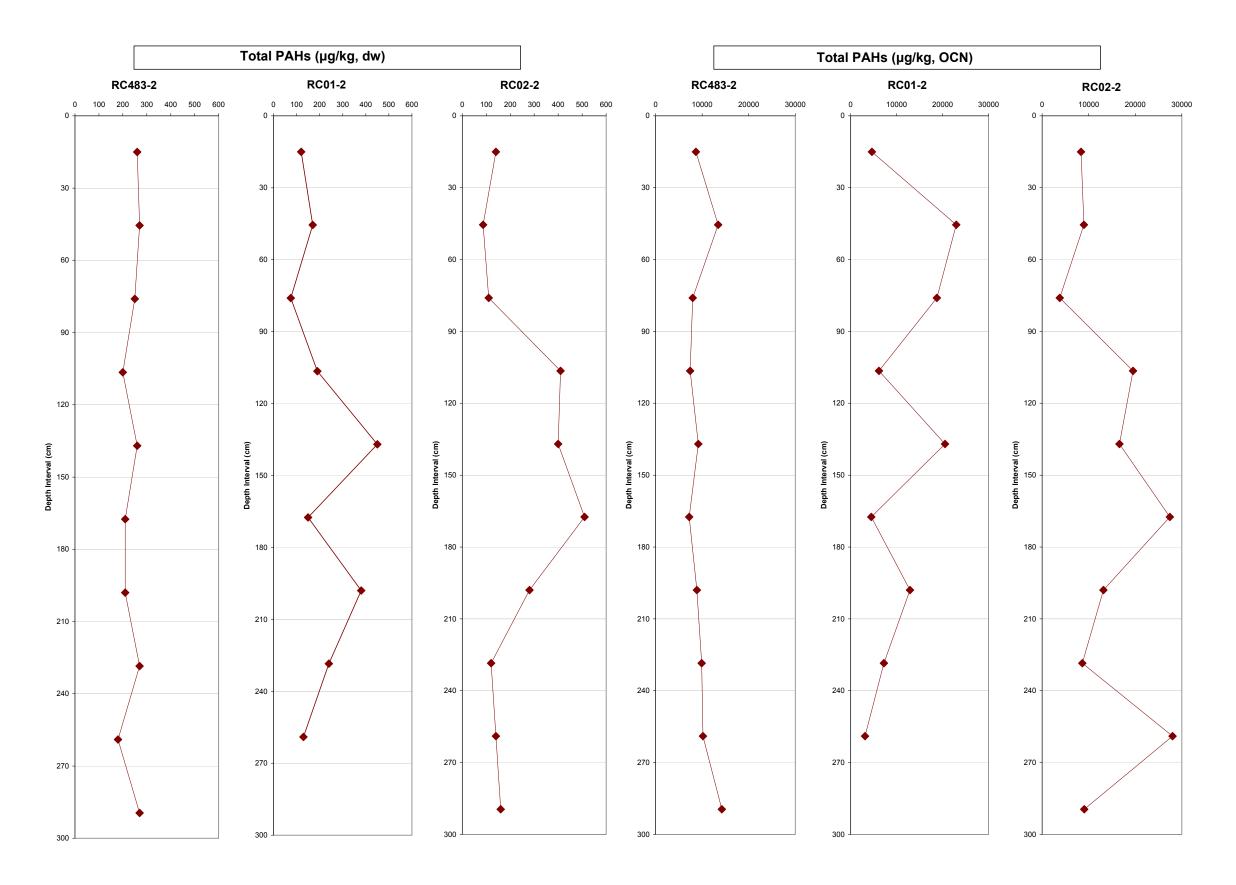


Figure 6.3-7
Portland Harbor RI/FS
Remedial Investigation Report
Total PAH Plots for RC483-2, RC01-2, RC02-1

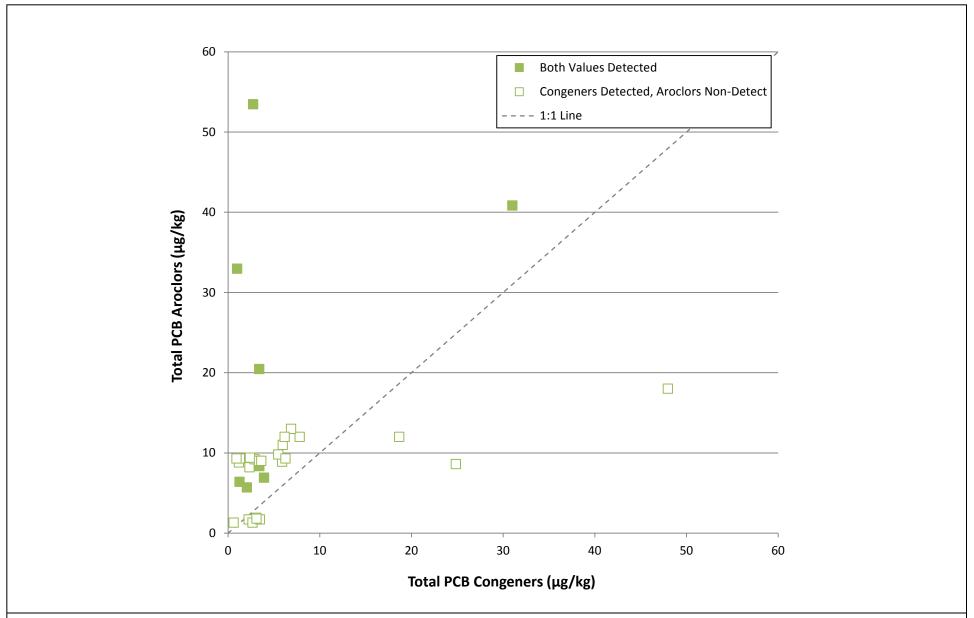


Figure 7.2-1
Portland Harbor RI/FS
Remedial Investigation Report
Correlation Plot of PCB Aroclors vs. PCB Congeners for
Background Sediment Data

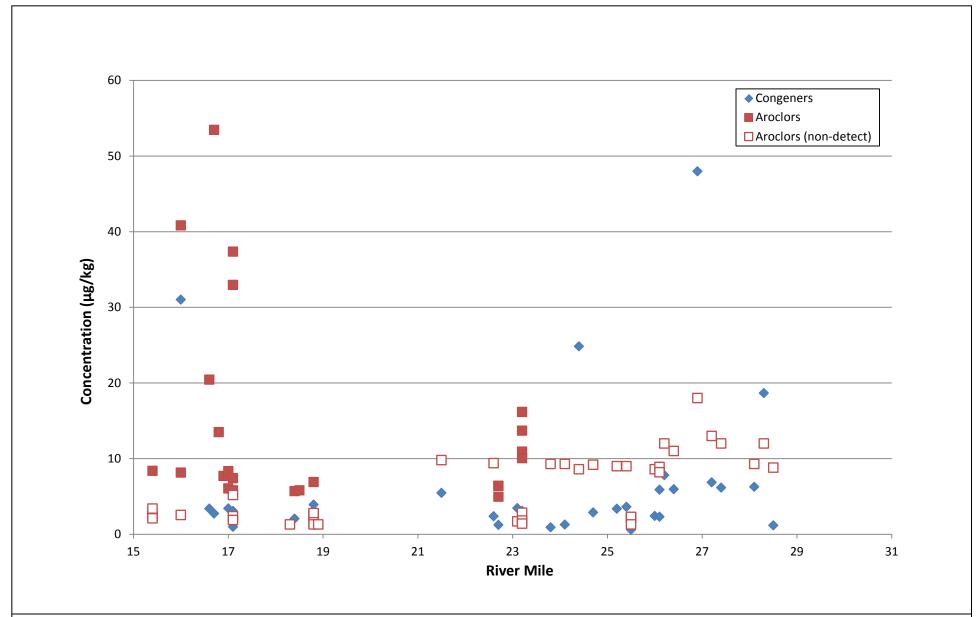
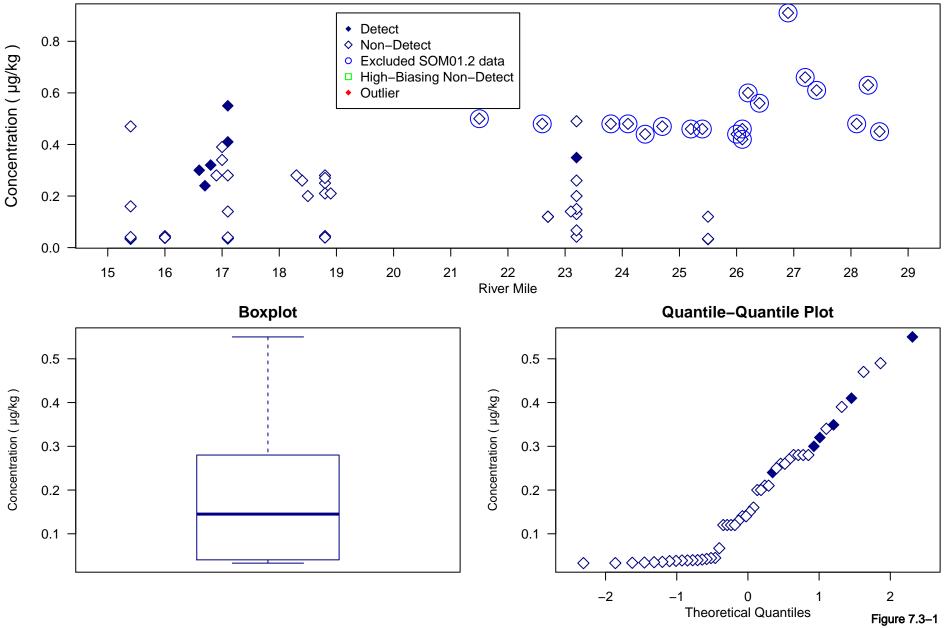


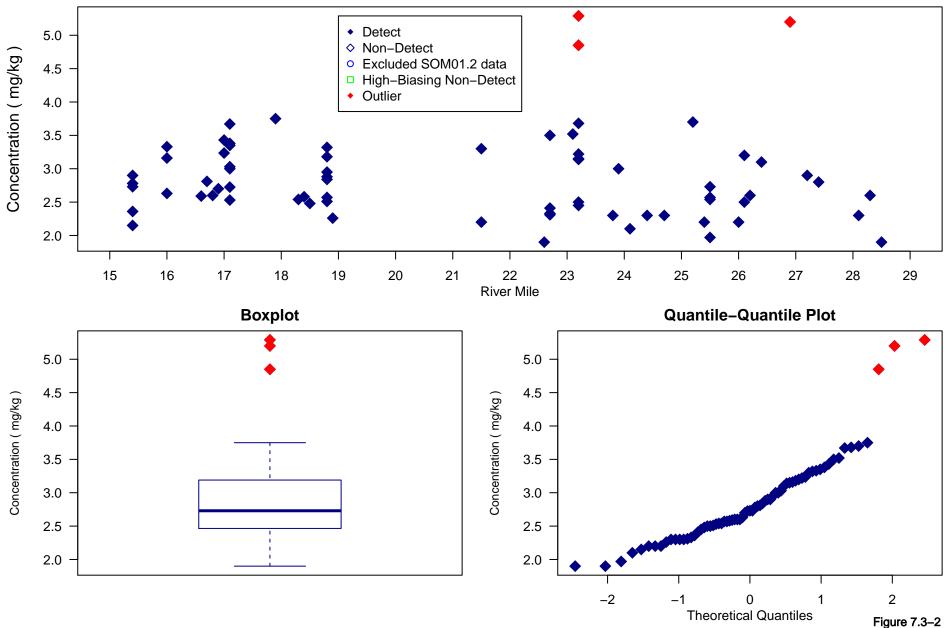
Figure 7.2-2
Portland Harbor RI/FS
Remedial Investigation Report
Comparison of PCB Aroclor and PCB Congener Data
for Background Sediment by River Mile

Aldrin (Dry Weight) Concentration versus River Mile



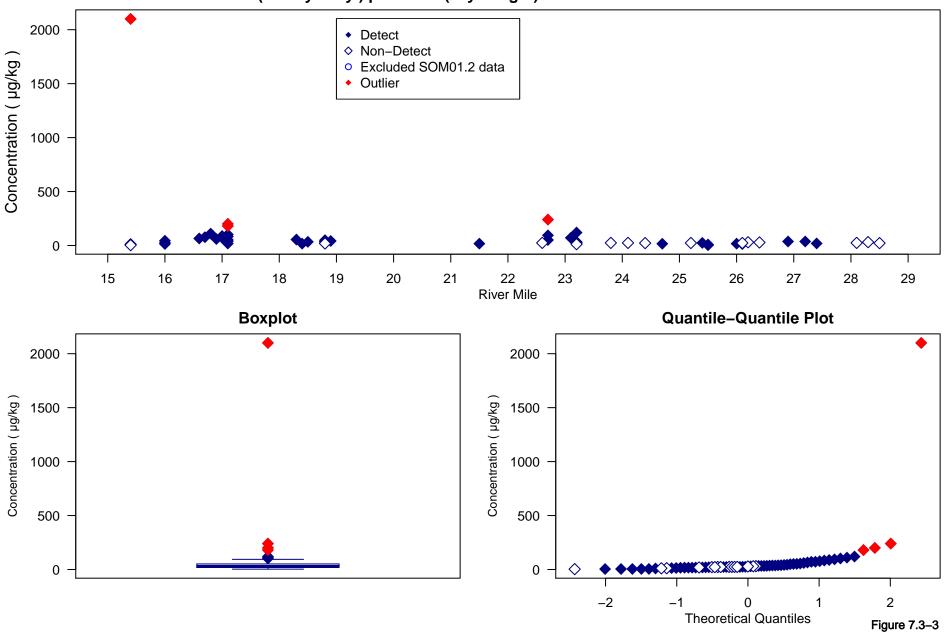
Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Aldrin (Dry Weight)

Arsenic (Dry Weight) Concentration versus River Mile

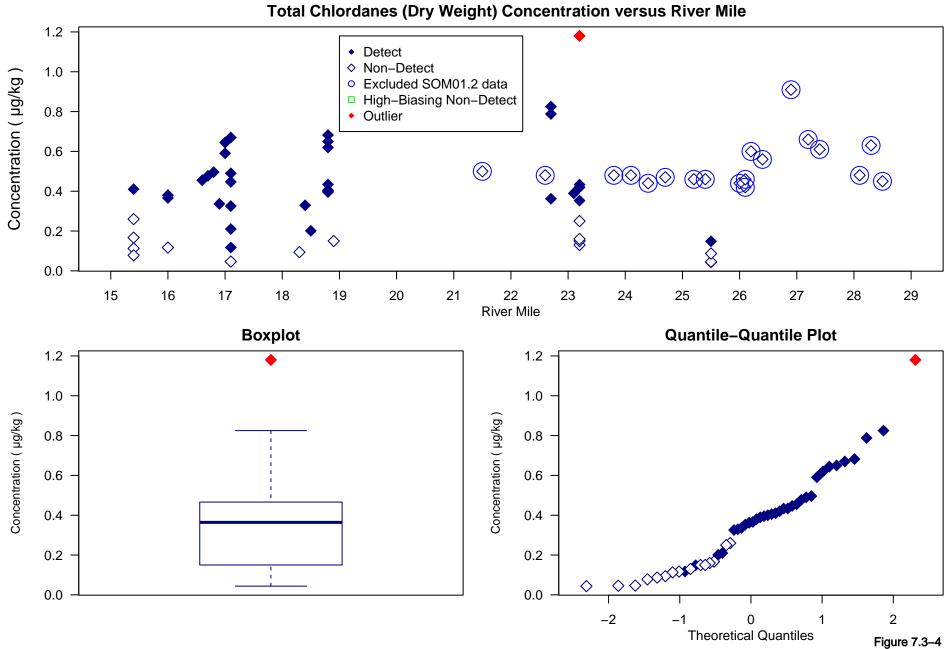


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Arsenic (Dry Weight)



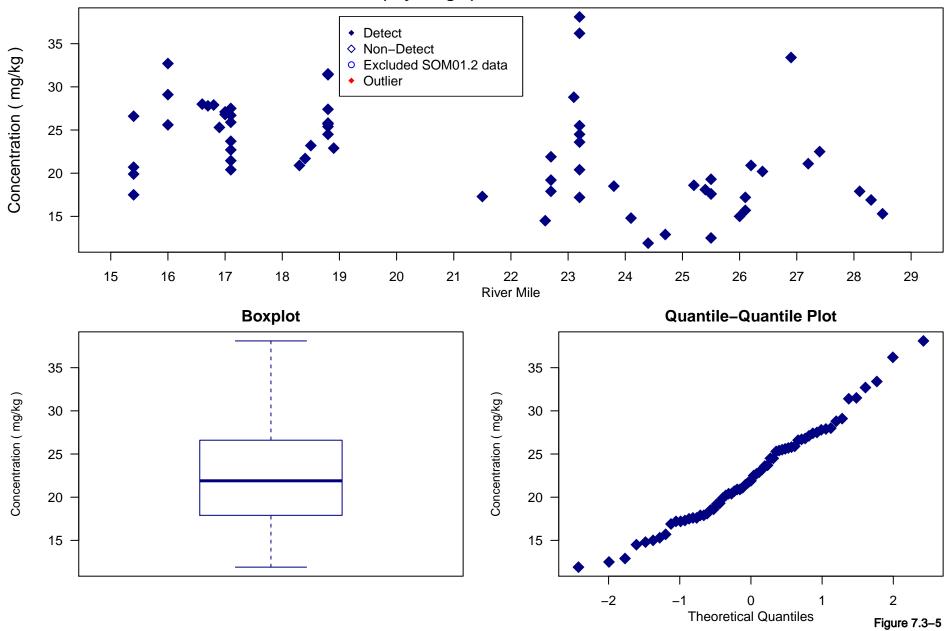


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Bis (2–ethylhexyl) phthalate (Dry Weight)



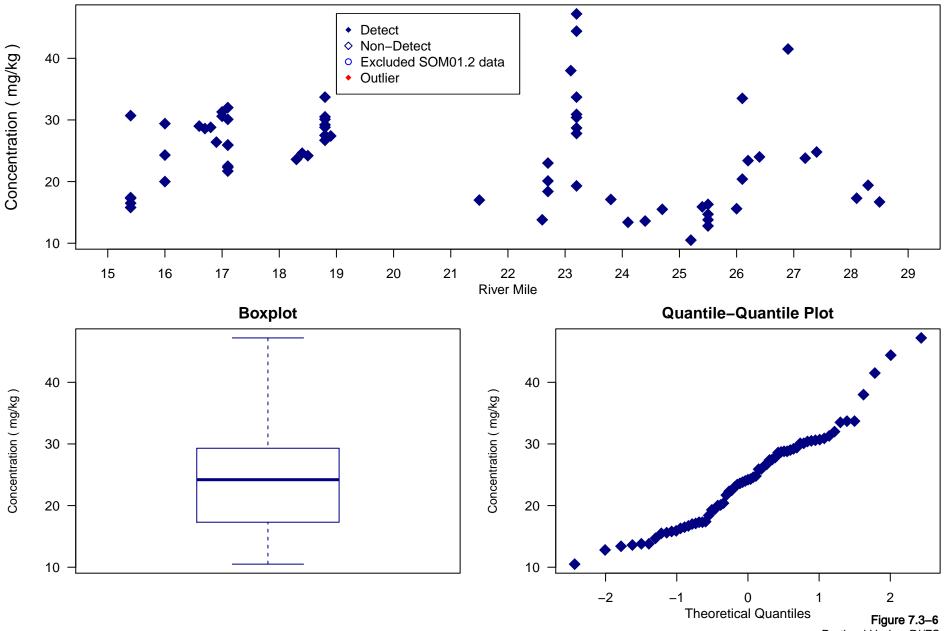
Portland Harbor RI/FS Remedial Investigation Report Background Upriver Bedded Sediment Outlier Analysis Total Chlordanes (Dry Weight)

Chromium (Dry Weight) Concentration versus River Mile

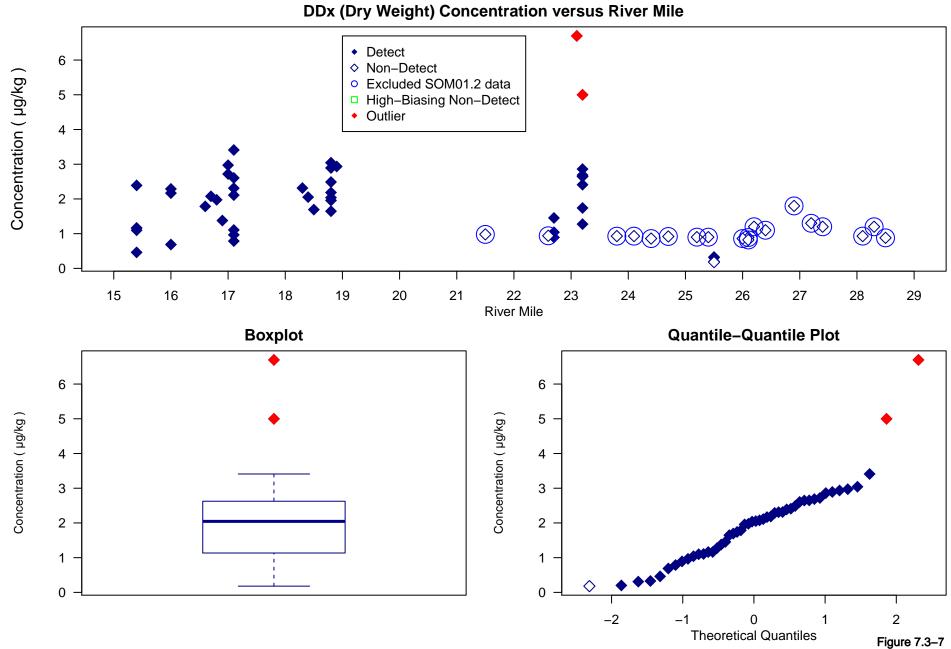


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Chromium (Dry Weight)

Copper (Dry Weight) Concentration versus River Mile

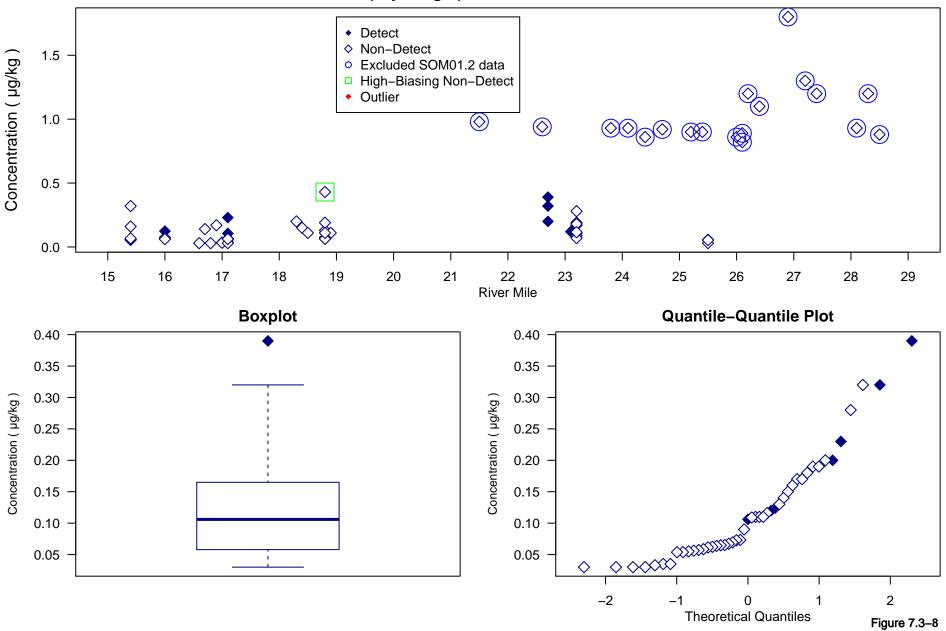


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Copper (Dry Weight)

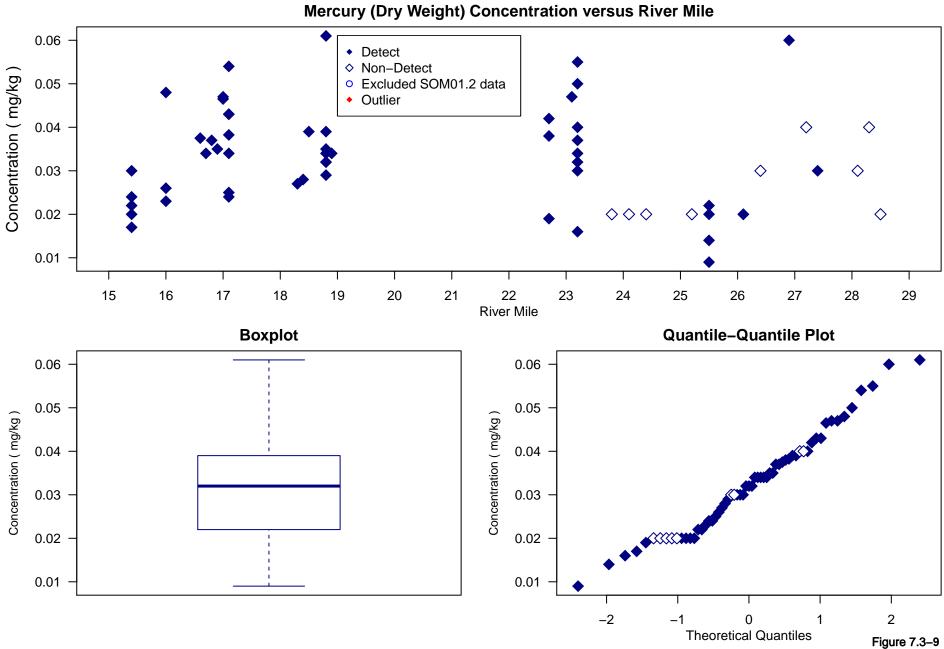


Portland Harbor RI/FS Remedial Investigation Report Background Upriver Bedded Sediment Outlier Analysis DDx (Dry Weight)

Dieldrin (Dry Weight) Concentration versus River Mile

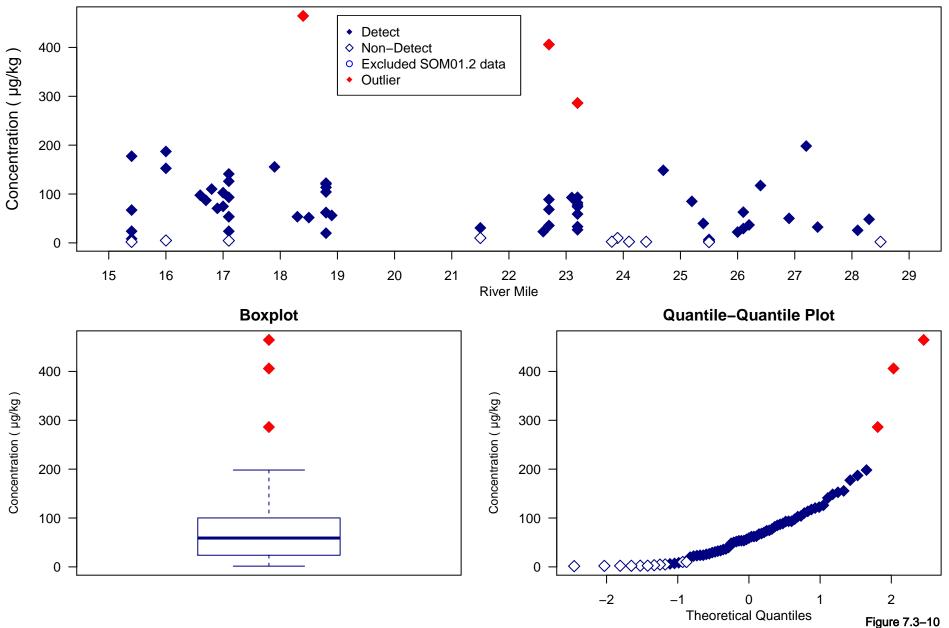


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Dieldrin (Dry Weight)



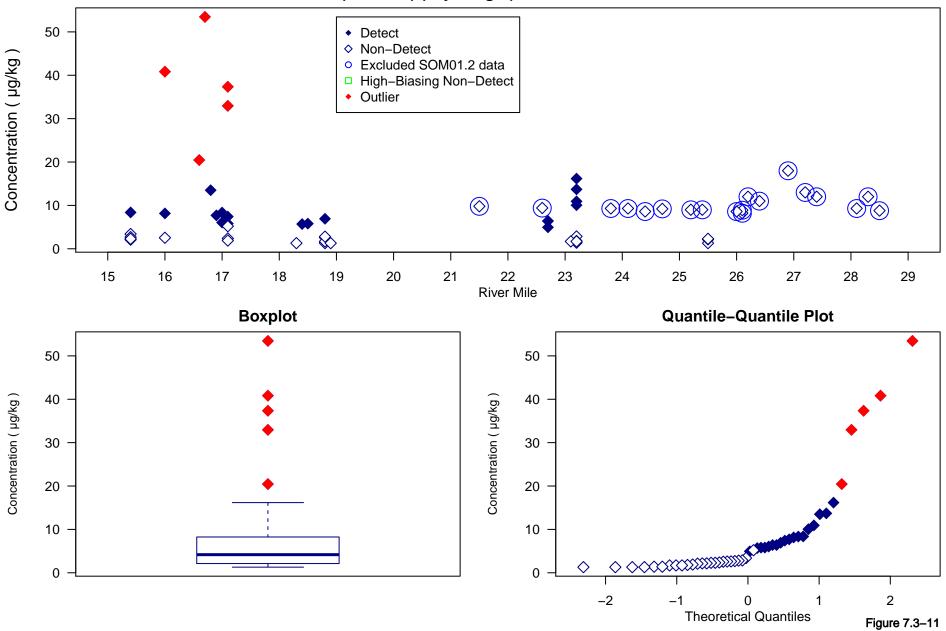
Portland Harbor RI/FS Remedial Investigation Report Background Upriver Bedded Sediment Outlier Analysis Mercury (Dry Weight)

Total PAHs (Dry Weight) Concentration versus River Mile



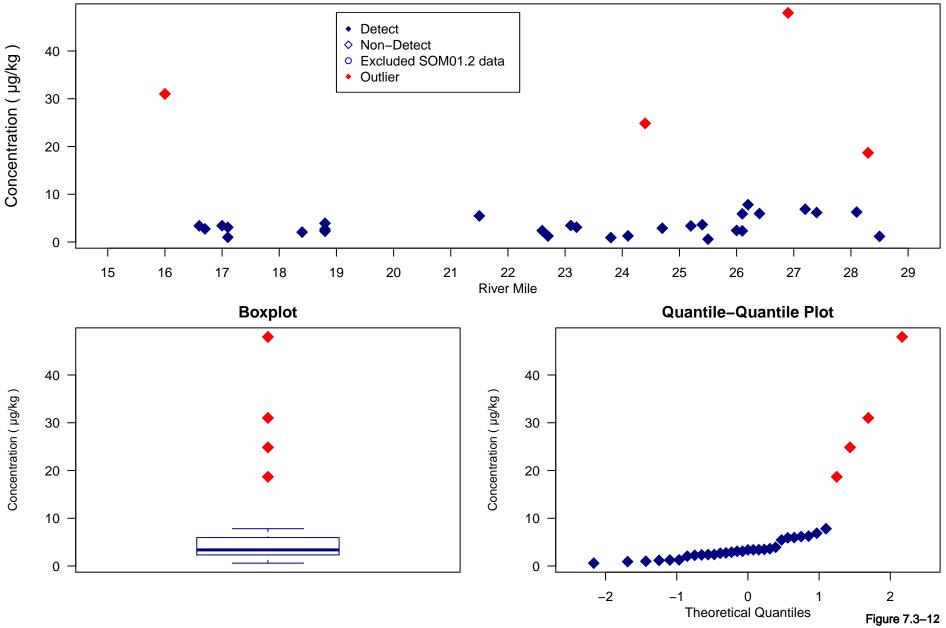
Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Total PAHs (Dry Weight)

Total PCBs (Aroclors) (Dry Weight) Concentration versus River Mile



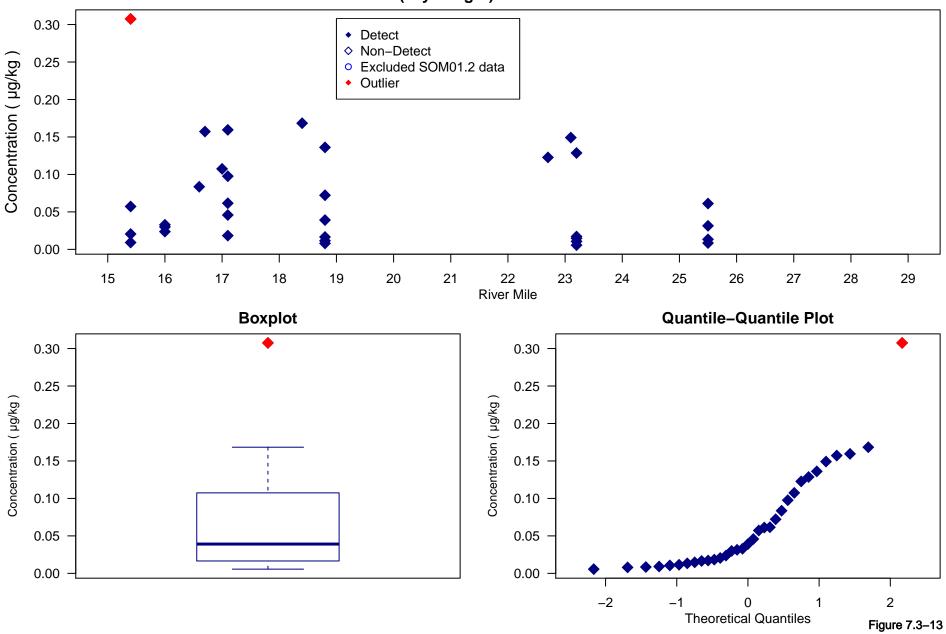
Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Total PCBs Aroclors (Dry Weight)

Total PCBs (Congeners) (Dry Weight) Concentration versus River Mile



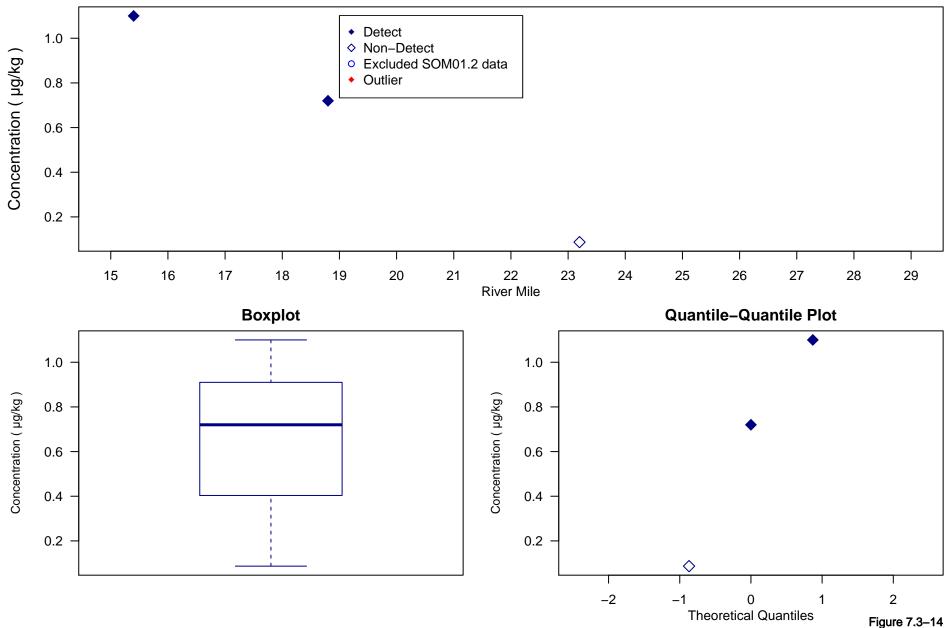
Portland Harbor RI/FS Remedial Investigation Report Background Upriver Bedded Sediment Outlier Analysis Total PCBs Congeners (Dry Weight)

Total PCDD/Fs (Dry Weight) Concentration versus River Mile



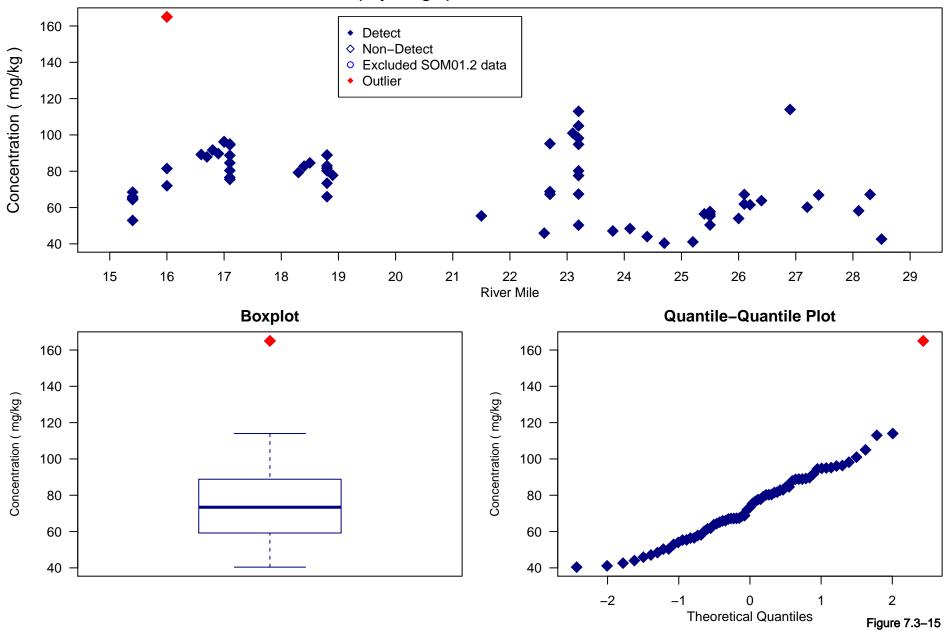
Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Total PCDD/Fs (Dry Weight)

Tributyltin Ion (Dry Weight) Concentration versus River Mile

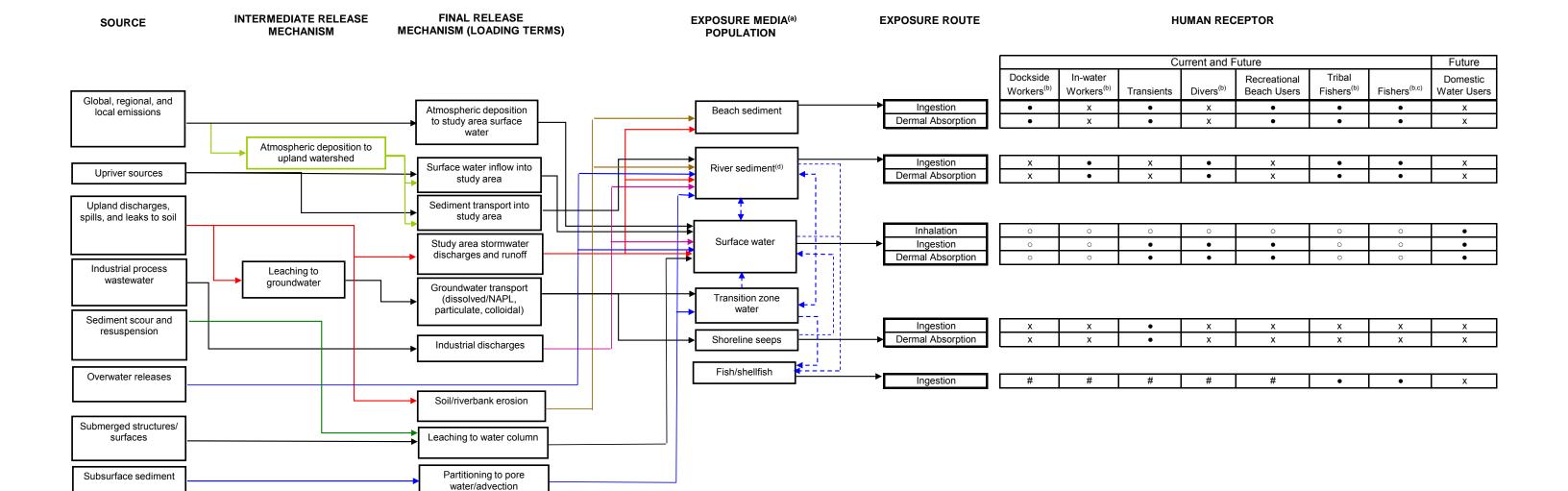


Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Tributyltin Ion (Dry Weight)

Zinc (Dry Weight) Concentration versus River Mile



Portland Harbor RI/FS
Remedial Investigation Report
Background Upriver Bedded Sediment Outlier Analysis
Zinc (Dry Weight)



- (a) This CSM includes exposure to media considered a part of the Portland Harbor RI/FS. It does not include media that will be evaluated as a part of the specific upland site evaluations and risk assessments.
- (b) Infant consumption of human milk evaluated as a potentially complete pathway for all adult receptors where PCBs, dioxins, or DDX are COPCs.
- (c) Fishers include three different fish ingestion rates, two different shellfish ingestion rates, and two different fishing frequencies.
- (d) River sediments evaluated in the BHHRA as an exposure media for ingestion and dermal absorption exposure routes include sediments collected at depths less than 30.5 centimeters.

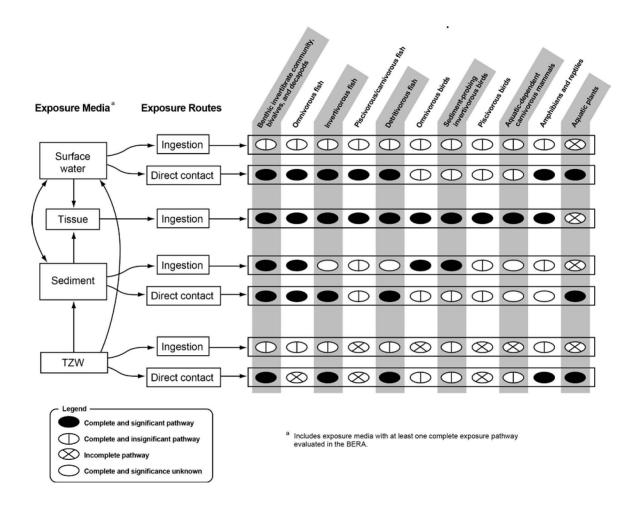
Legend

- = Potentially complete pathway
- **x** = Incomplete pathway
- # = Potentially complete pathway but evaluated under a different receptor category in the BHHRA.
- \circ = Potentially complete pathway but not evaluated in the BHHRA because exposure is expected to be insignificant.
- Solid lines indicate potential pathways for COPCs to the study area.
- Dashed lines indicated potential transport pathways for COPCs between exposure media within the study area

Acronym

BHHRÁ (Baseline Human Health Risk Assessment)
COPCs (Chemicals of Potential Concern)
CSM (Conceptual Site Model)
NAPL (Non-Aqueous Phase Liquid)
RI/FS = Remedial Investigation/Feasibility Study

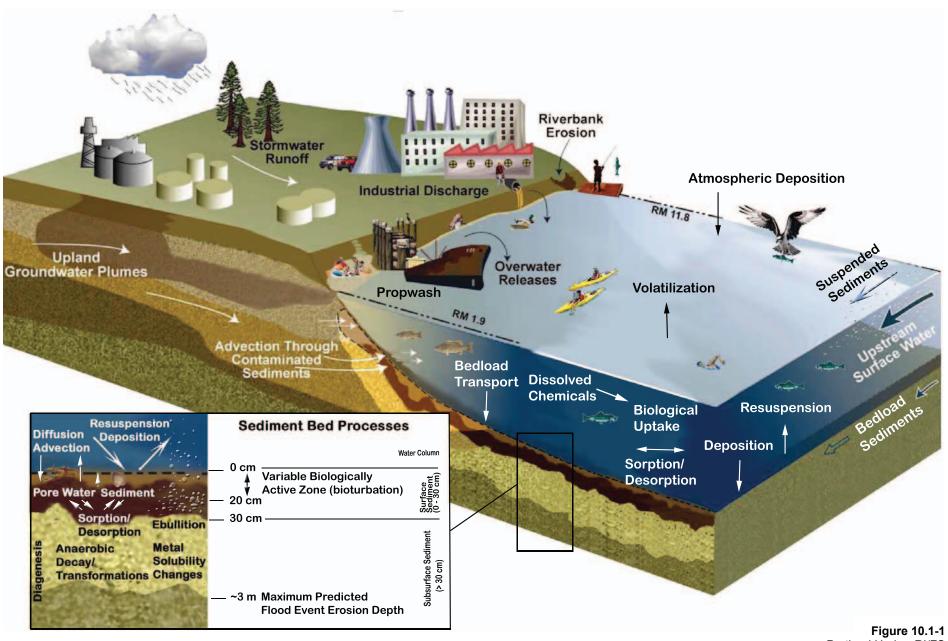
Figure 8.2-1
Portland Harbor RI/FS
Remedial Investigation Report
Human Health Risk Assessment Conceptual Site Model



The only exposure media shown are those evaluated in the BERA, for the assessment endpoints and measurement endpoints identified by EPA. The simplified CSM does not include receptors that were not evaluated in the BERA, such as zooplankton or terrestrial plants in the riparian zone; however, they are shown in the expanded CSM (Appendix G, Attachment 2).

The simplified CSM also presents tissue as a separate exposure medium; in the refined ecological CSM, exposure to tissue is identified as a dietary exposure route under each abiotic exposure medium.

Figure 9.6-1 Portland Harbor RI/FS Remedial Investigation Report Simplified Ecological CSM



Portland Harbor RI/FS
Remedial Investigation Report
Major Elements of the Portland Harbor CSM

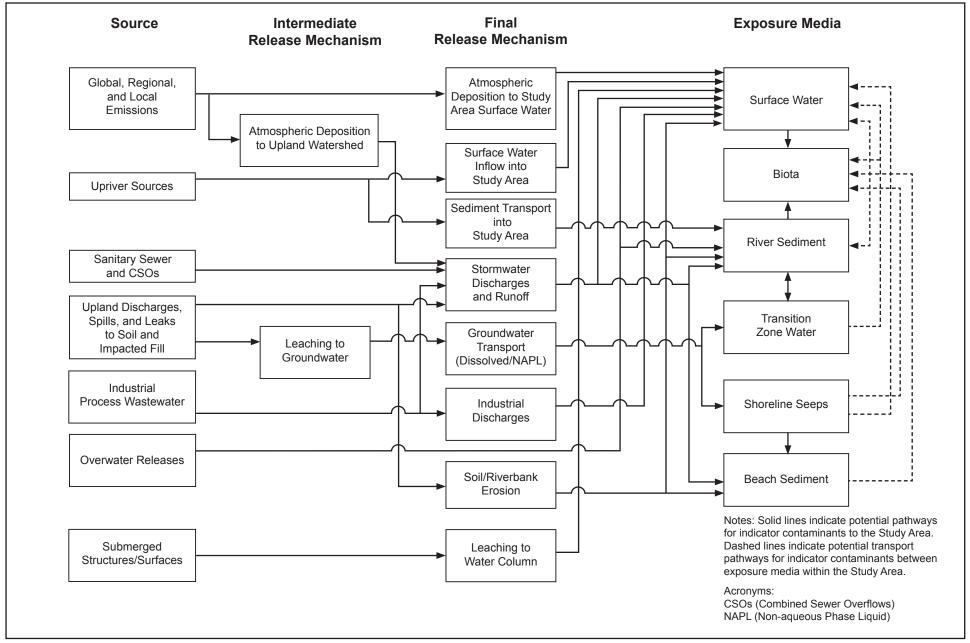
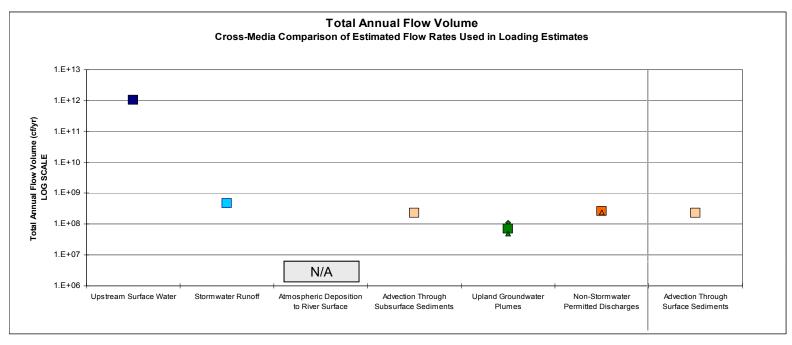


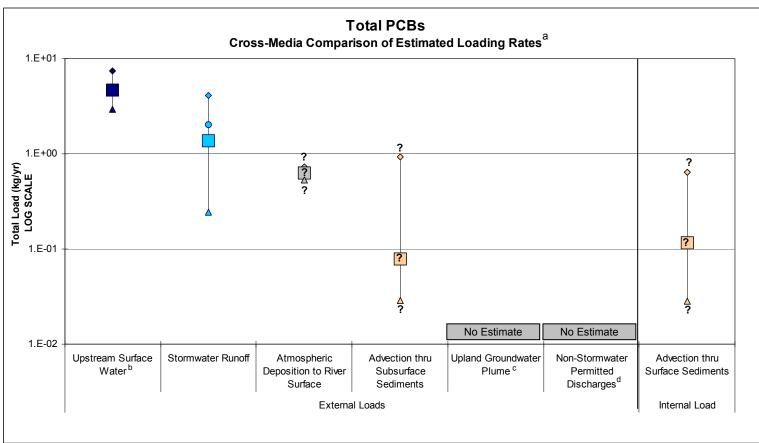
Figure 10.1-2
Portland Harbor RI/FS
Remedial Investigation Report
Physical Conceptual Site Model





- •Upstream surface water flow is based on the average annual flow measured at Morrison Bridge from 1975 to 2003.
- •Stormwater runoff volumes shown are the sum of the modeled 50th percentile flows for each land use category and "non-representative" location.
- •Upland groundwater plume flow rates represent the range of all flow measurements made with seepage meters at the nine TZW focus sites.
- •The surface and subsurface sediment advective groundwater central unit flux rate of 7.3 cfs was estimated based on available site hydrogeologic information.
- •Non-stormwater permitted discharge volumes presented here are the range of individual flow measurements reported monthly or quarterly in discharge monitoring reports for the most recent two years available for individual and general 1500A industrial permits.

Figure 10.1-3 Portland Harbor RI/FS Remedial Investigation Report Cross-Media Comparison of Estimated Flow Rates Used in Load Estimates



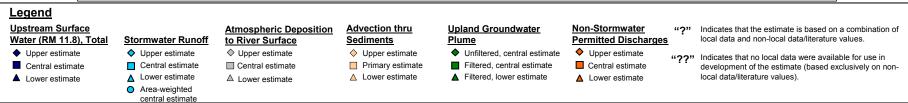


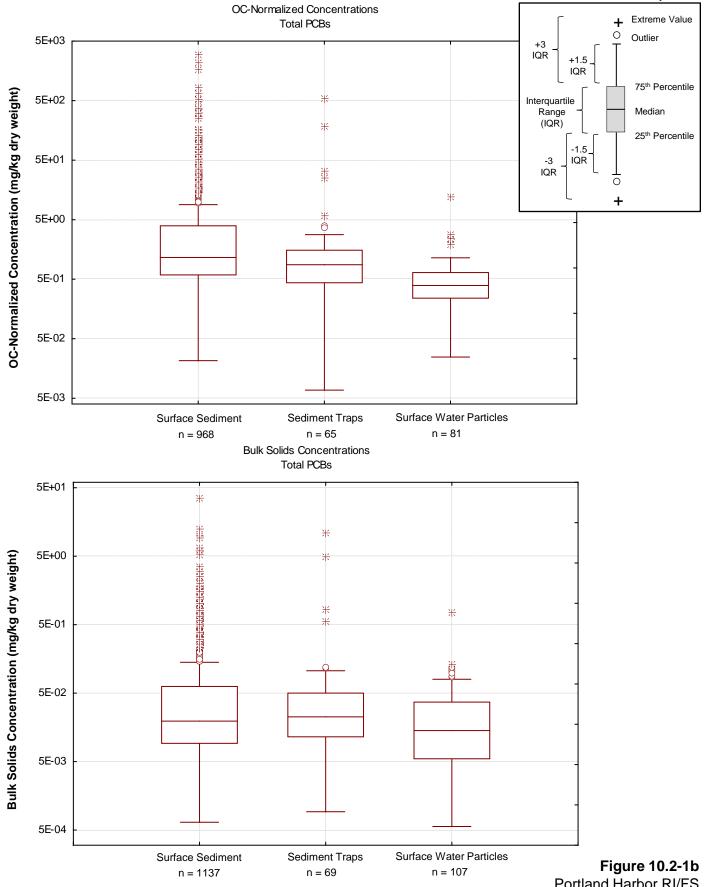
Figure 10.2-1a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Total PCBs – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^d The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of Total PCBs Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

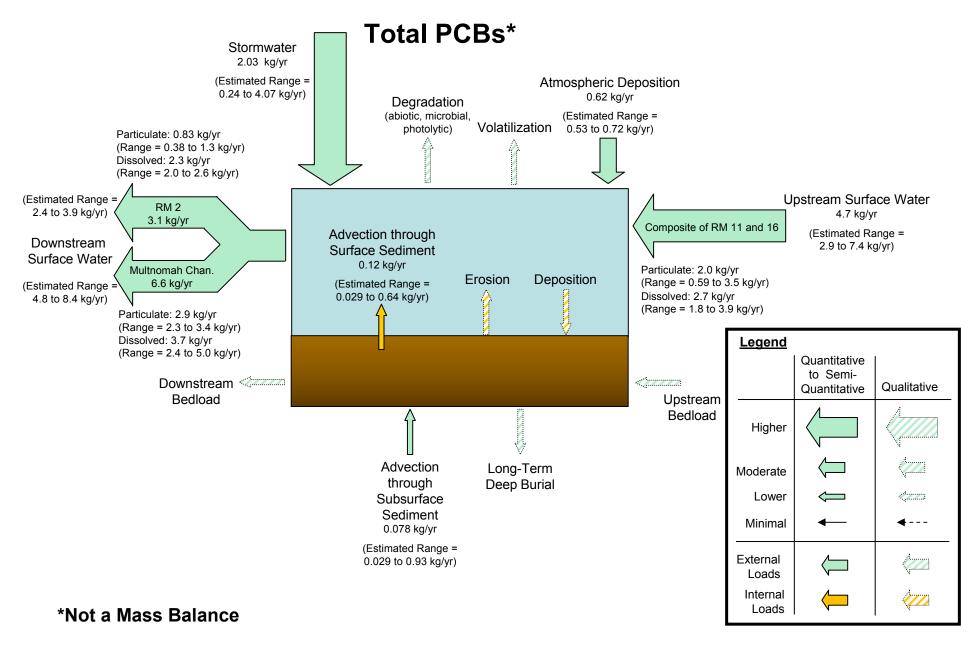
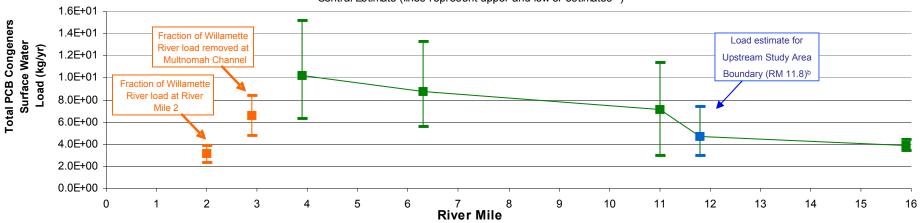


Figure 10.2-2
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Total PCBs – Study Area Annual Central Loading Estimate

Total PCB Congeners

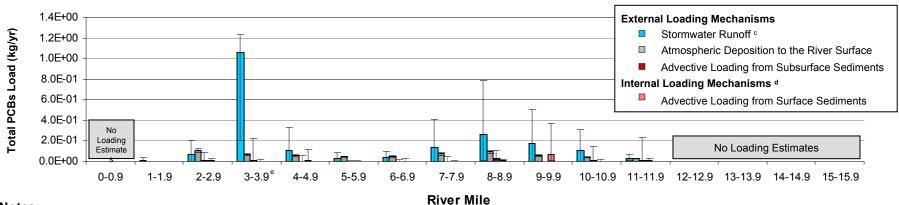
Estimated Total Annual Surface Water Load

Central Estimate (lines represent upper and low er estimates a)



Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimatesa)



Notes:

^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

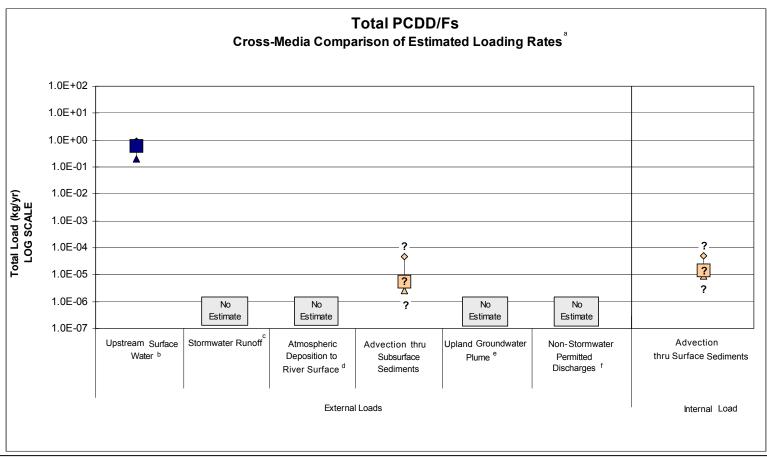
^e Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

Figure 10.2-3
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Total PCBs

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

^d Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.



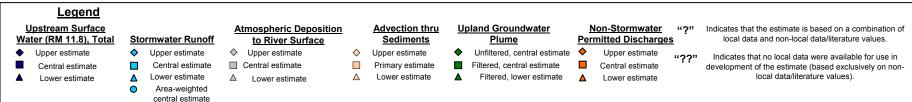


Figure 10.2-4a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Total PCDD/Fs – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

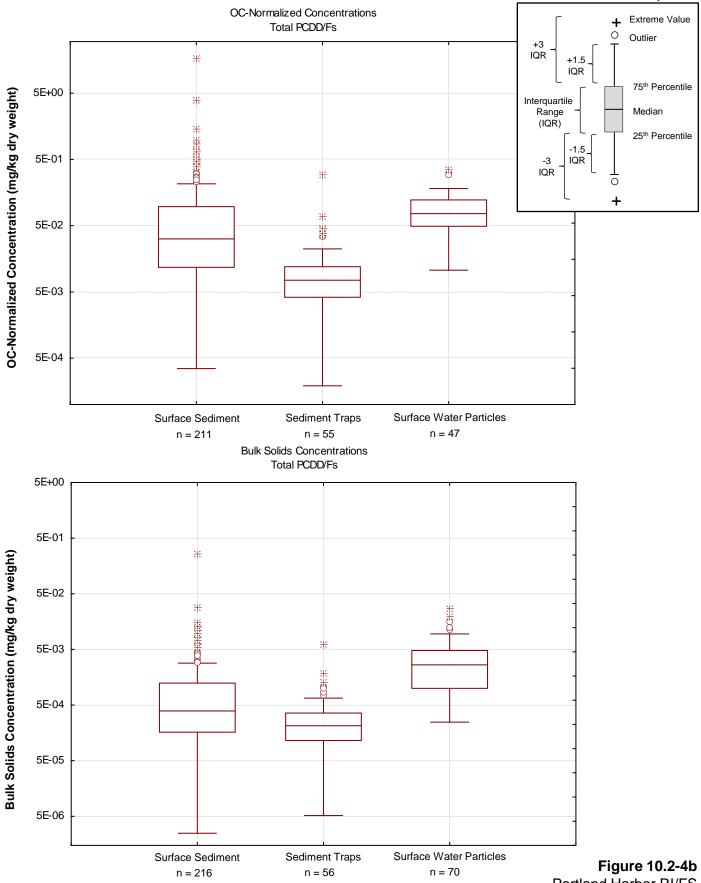
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c The chemical was not sampled in the LWG stormwater sampling program; therefore, no loading estimates could be generated.

d No relevant atmospheric concentration data were found for this chemical; therefore, no loading estimates could be generated.

^e The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^f The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of Total PCDD/Fs Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

Total PCDD/Fs*

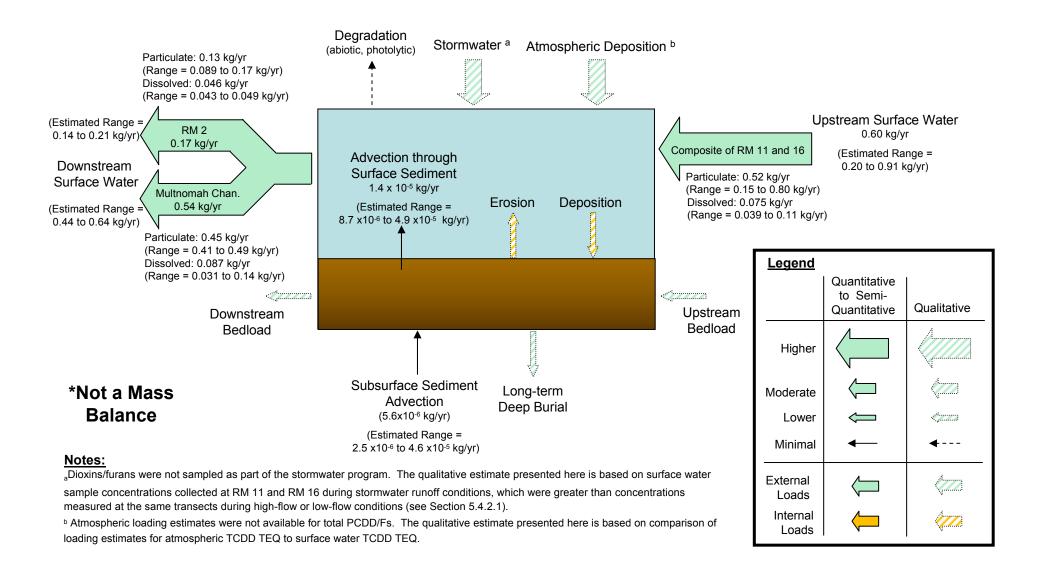
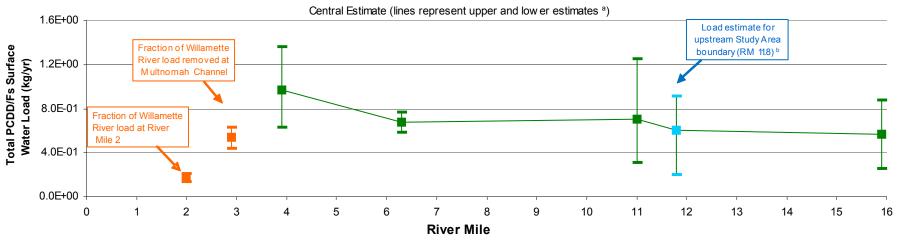


Figure 10.2-5
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Total PCDD/Fs – Study Area Annual Central Loading Estimate

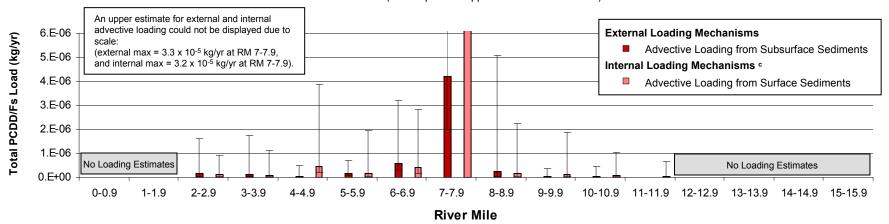
Total PCDD/Fs

Estimated Total Annual Surface Water Load



Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimatesa)



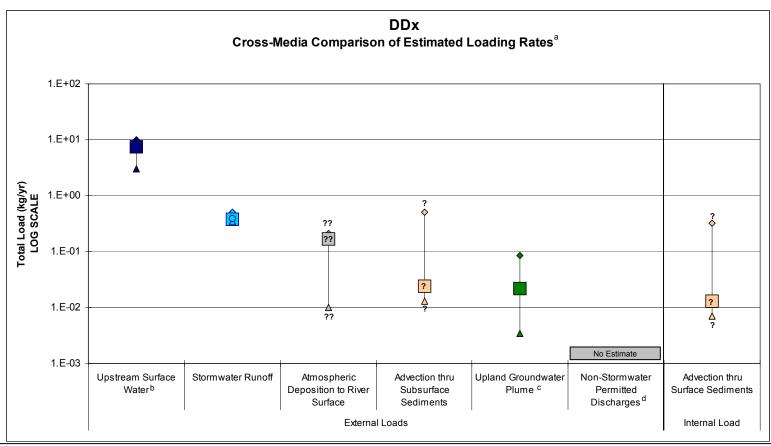
Notes:

^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

^c Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

Figure 10.2-6 Portland Harbor RI/FS Remedial Investigation Report Surface Water Load and Loading Comparison by River Mile Total PCDD/Fs

b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.



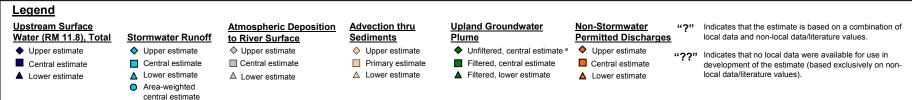


Figure 10.2-7a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
DDx– Estimated Total Annual Study Area Loads

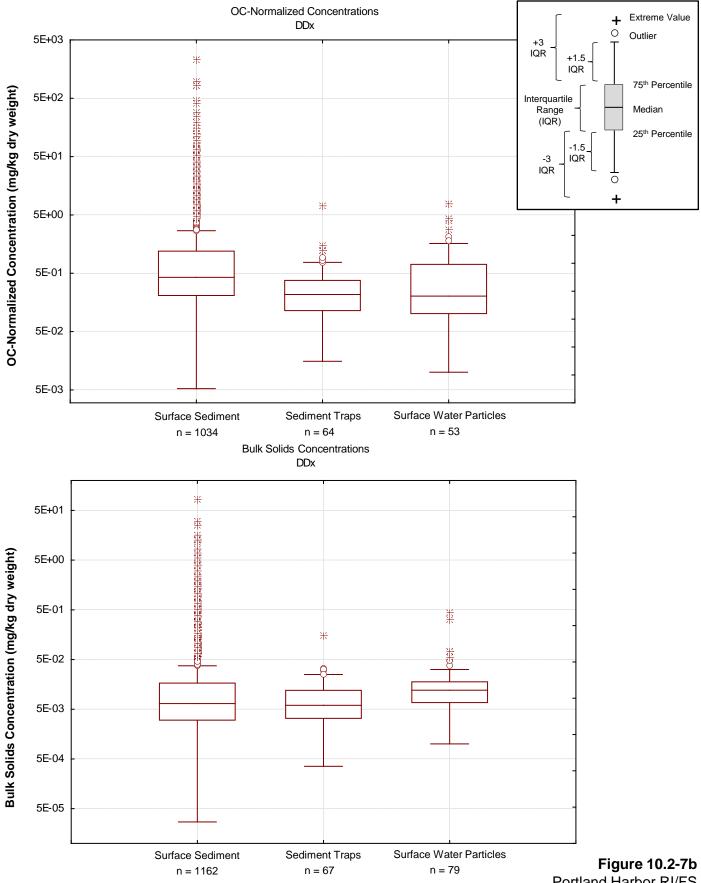
a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

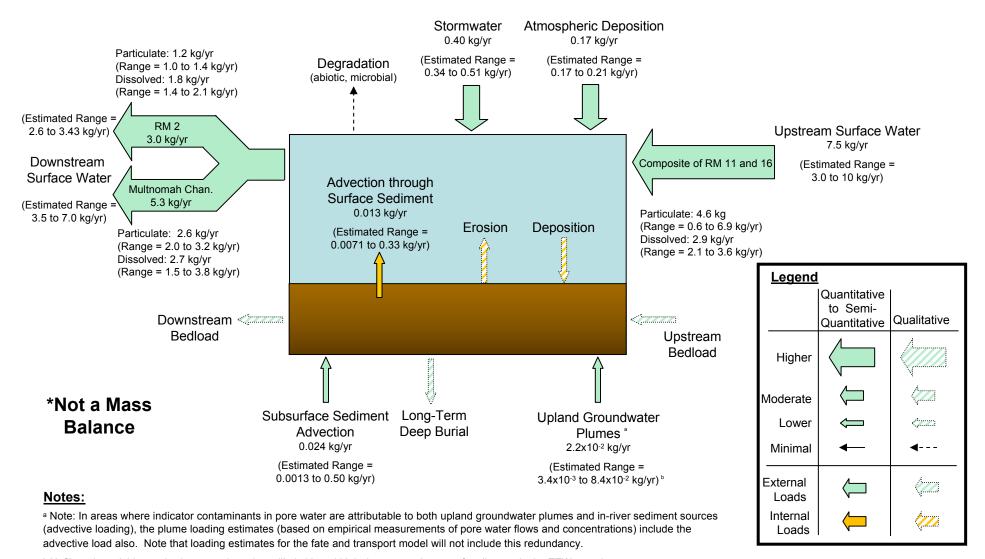
^d The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.

^e Unfiltered pesticide results are likely biased high due to entrainment of sediments in the TZW samples.



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of DDx Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

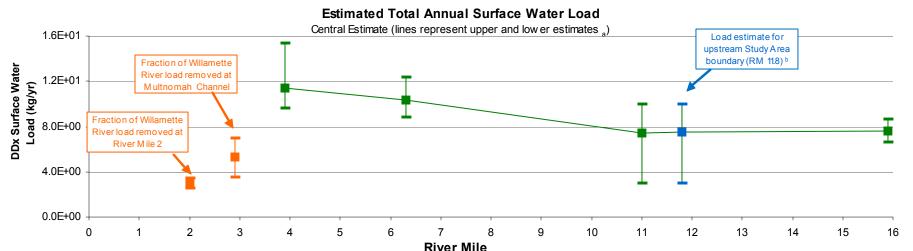
DDx*



^b Unfiltered pesticide results (upper estimate) are likely biased high due to entrainment of sediments in the TZW samples.

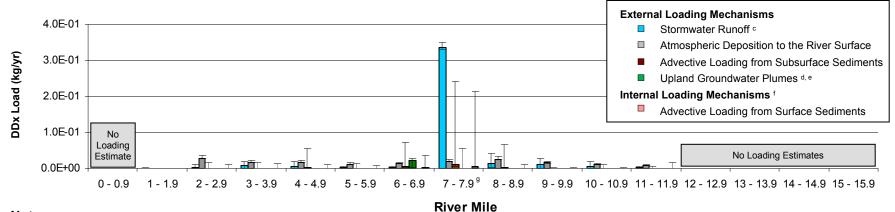
Figure 10.2-8
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
DDx – Study Area Annual Central Loading Estimate





Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimatesa)



Notes:

Figure 10.2-9
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
DDx

^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

e Unfiltered pesticide results (upper estimate) are likely biased high due to entrainment of sediments in the TZW samples

f Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

g Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

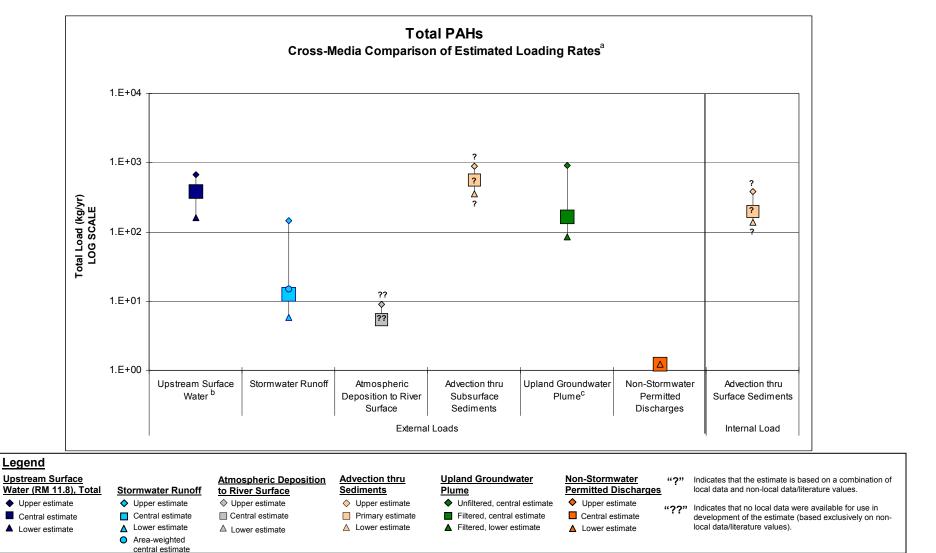
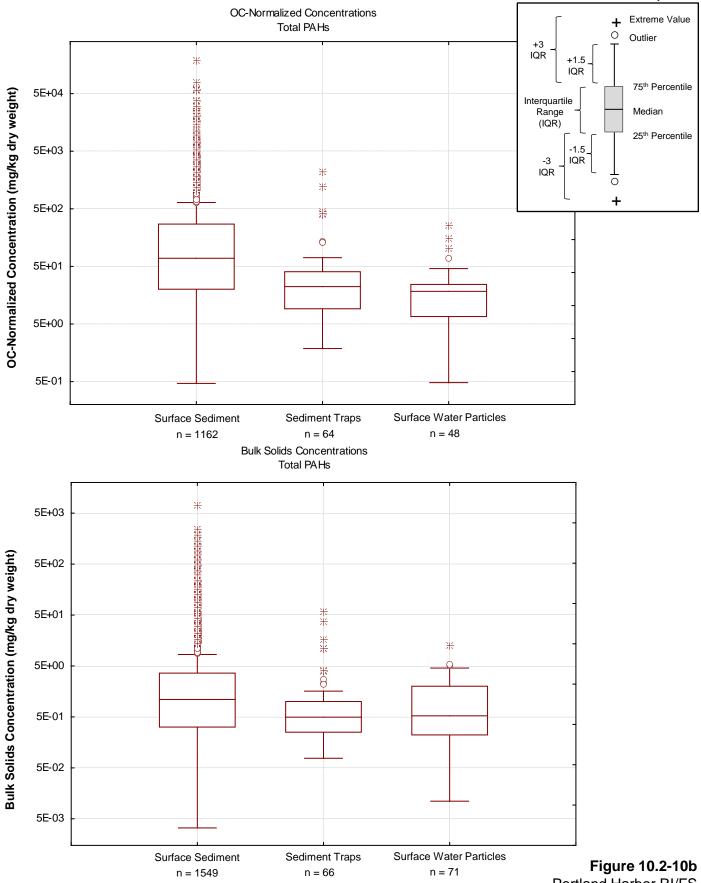


Figure 10.2-10a Portland Harbor RI/FS Remedial Investigation Report Cross-Media Loading Comparison Total PAHs – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.



Portland Harbor RI/FS
Remedial Investigation Report
Box –Whisker Plots of Total PAHs Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

Total PAHs*

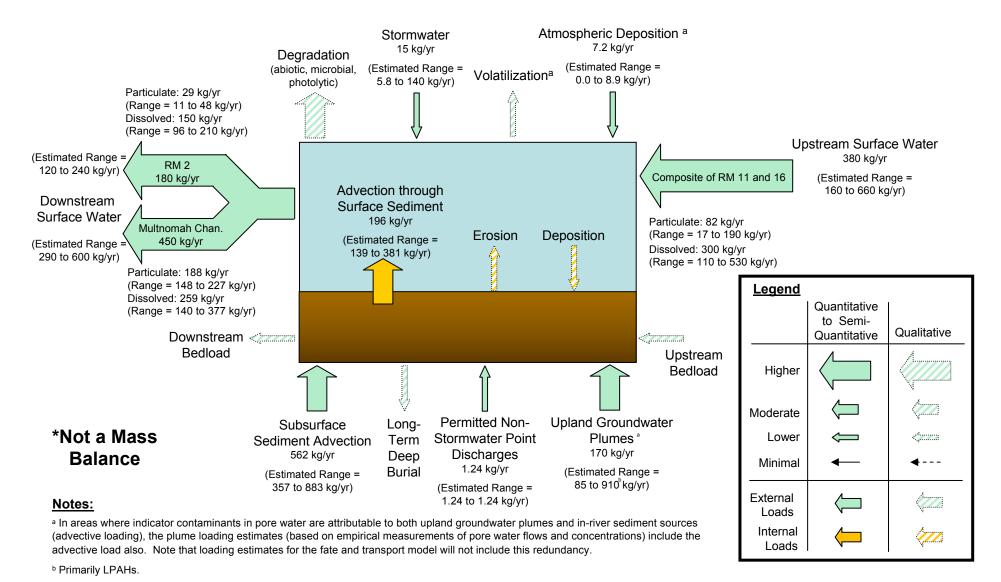


Figure 10.2-11a
Portland Harbor RI/FS
Remedial Investigation Report

Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Total PAHs – Study Area Annual Central Loading Estimate

LPAHs*

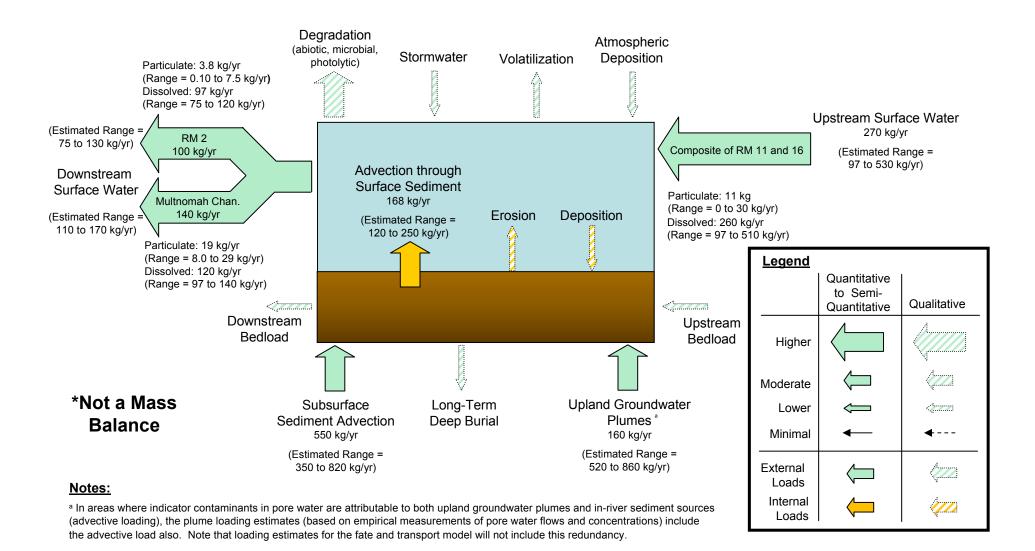


Figure 10.2-11b
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
LPAHs – Study Area Annual Central Loading Estimate

HPAHs*

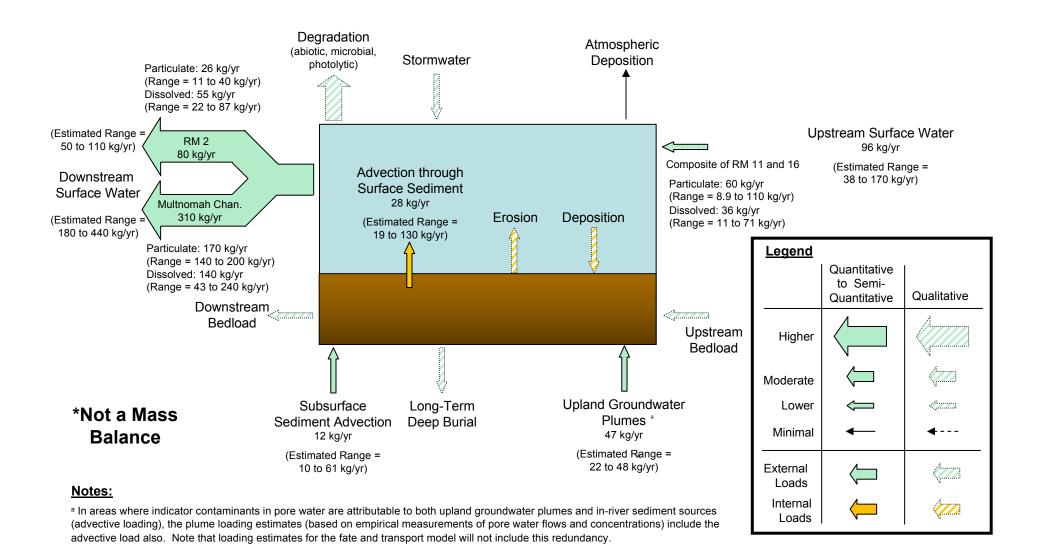
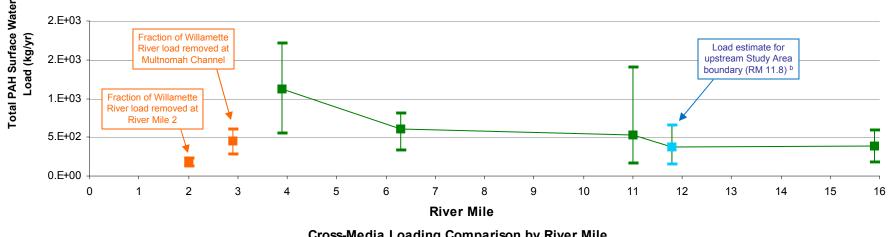


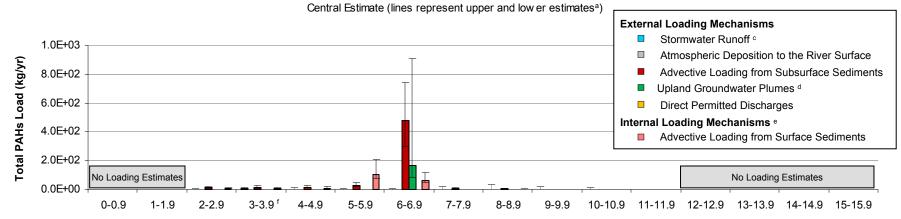
Figure 10.2-11c
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
HPAHs – Study Area Annual Central Loading Estimate

Total PAHs Estimated Total Annual Surface Water Load

Central Estimate (lines represent upper and low er estimates a)



Cross-Media Loading Comparison by River Mile



River Mile

Notes:

a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Figure 10.2-12 Portland Harbor RI/FS Remedial Investigation Report Surface Water Load and Loading Comparison by River Mile **Total PAHs**

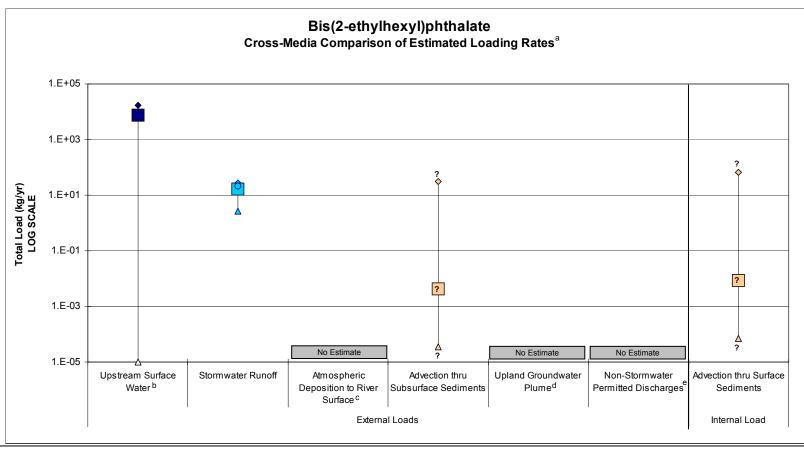
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

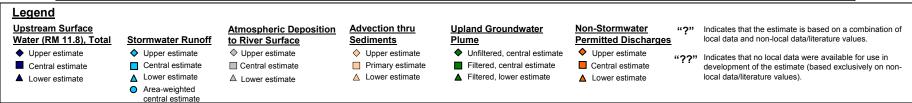
Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

e Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

f Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).





Hollow symbols indicate loads calculated with sample concentrations below the laboratory detection limit. These loads were estimated at 0 kg/yr.

- a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.
- b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.
- ^c No relevant atmospheric concentration data were found for this chemical; therefore, no loading estimates could be generated.
- ^d The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.
- ^e The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.

Poading calculations.

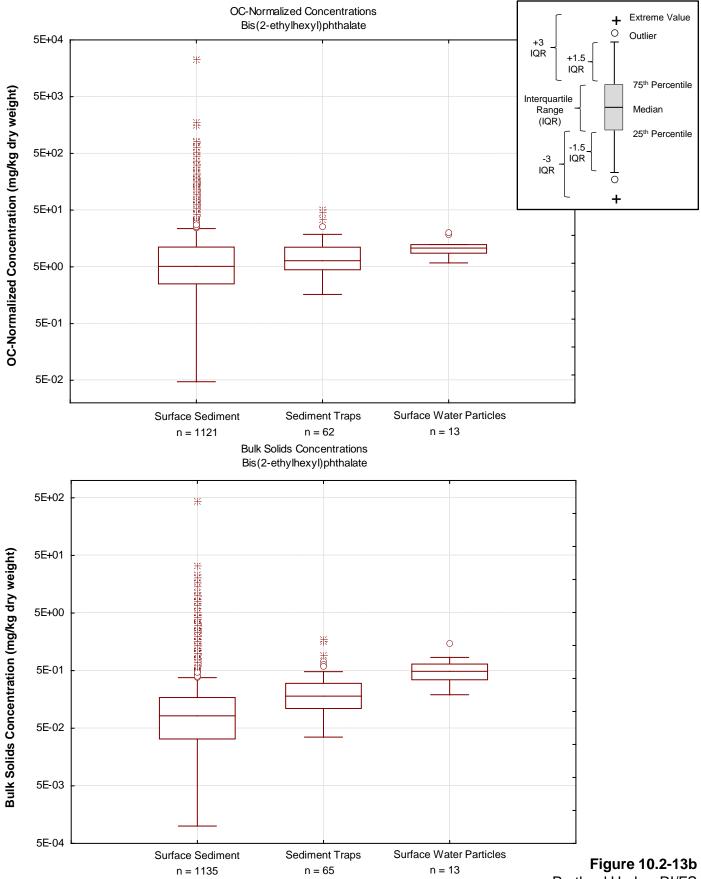
Figure 10.2-13a

Portland Harbor RI/FS

Remedial Investigation Report

Cross-Media Loading Comparison

Bis(2-ethylhexyl)phthalate – Estimated Total Annual Study Area Loads



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of Bis(2-ethylhexyl)phthalate Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

Bis(2-ethylhexyl)phthalate*

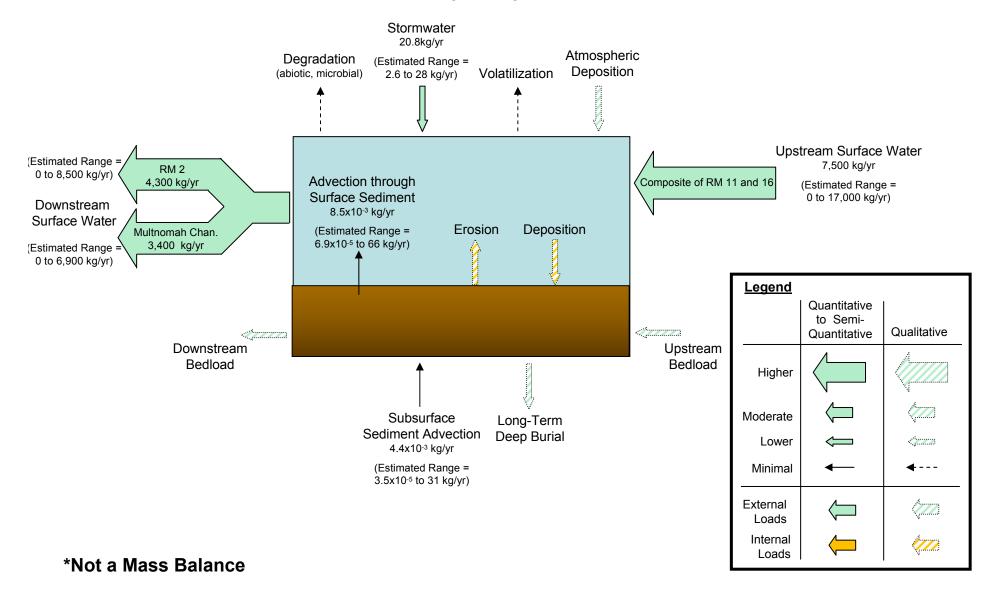


Figure 10.2-14
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Bis(2-ethylhexyl)phthalate – Study Area Annual Central Loading Estimate

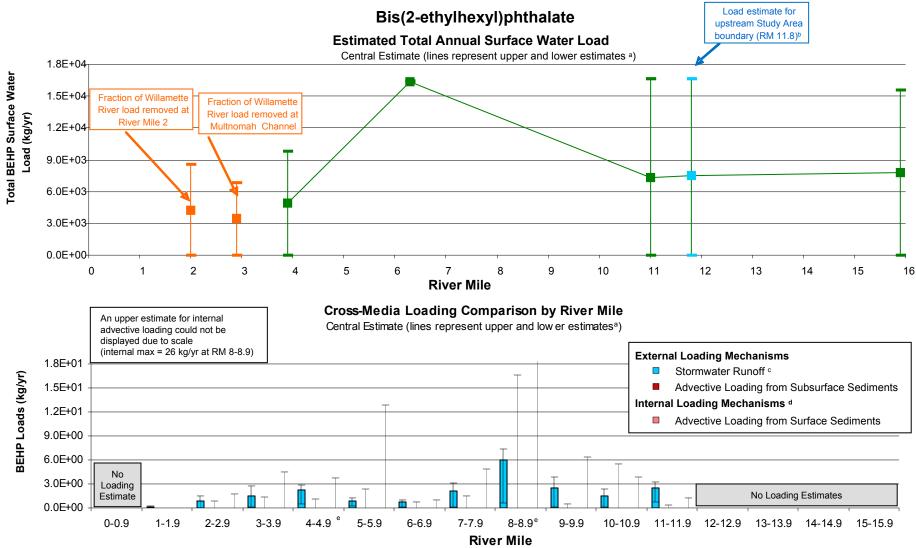


Figure 10.2-15
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Bis(2-ethylhexyl)phthalate

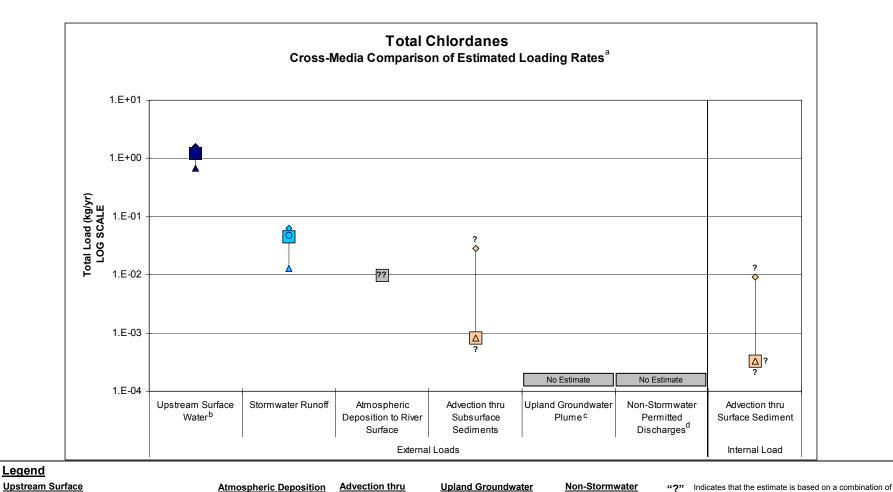
^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

d Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results

e Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).



Plume

Unfiltered, central estimate

Filtered, central estimate

▲ Filtered, lower estimate

Notes:

Water (RM 11.8), Total

Upper estimate

Central estimate

▲ Lower estimate

Sediments

Upper estimate

Primary estimate

▲ Lower estimate

Stormwater Runoff

Upper estimate

Central estimate

▲ Lower estimate

 Area-weighted central estimate to River Surface

Upper estimate

Central estimate

△ Lower estimate

Figure 10.2-16a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Total Chlordanes – Estimated Total Annual Study Area Loads

local data and non-local data/literature values.

"??" Indicates that no local data were available for use in

local data/literature values).

development of the estimate (based exclusively on non-

Permitted Discharges

Upper estimate

Central estimate

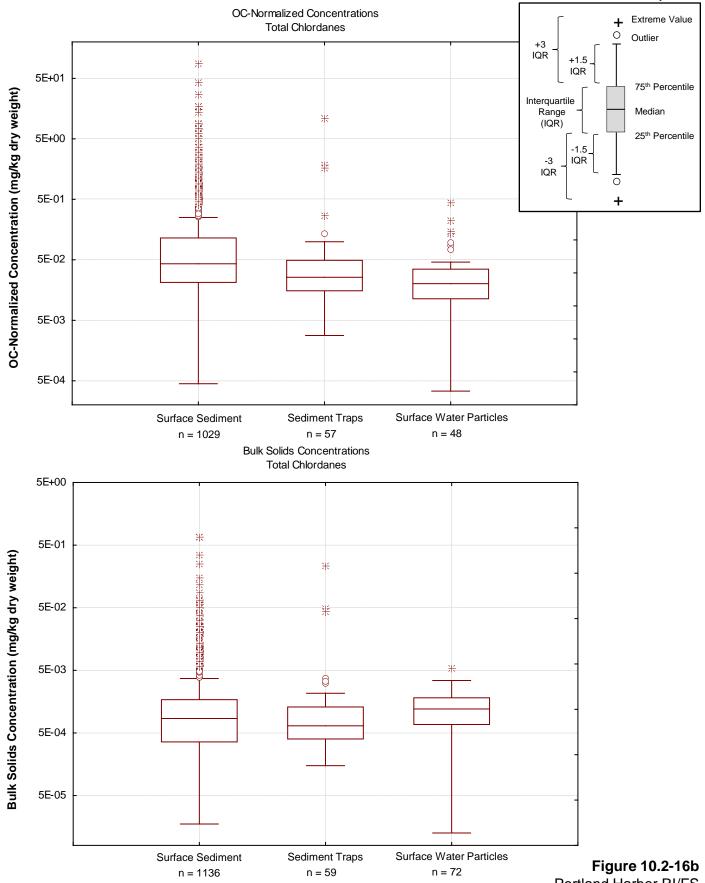
▲ Lower estimate

^a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^d The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of Total Chlordanes Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

Total Chlordanes*

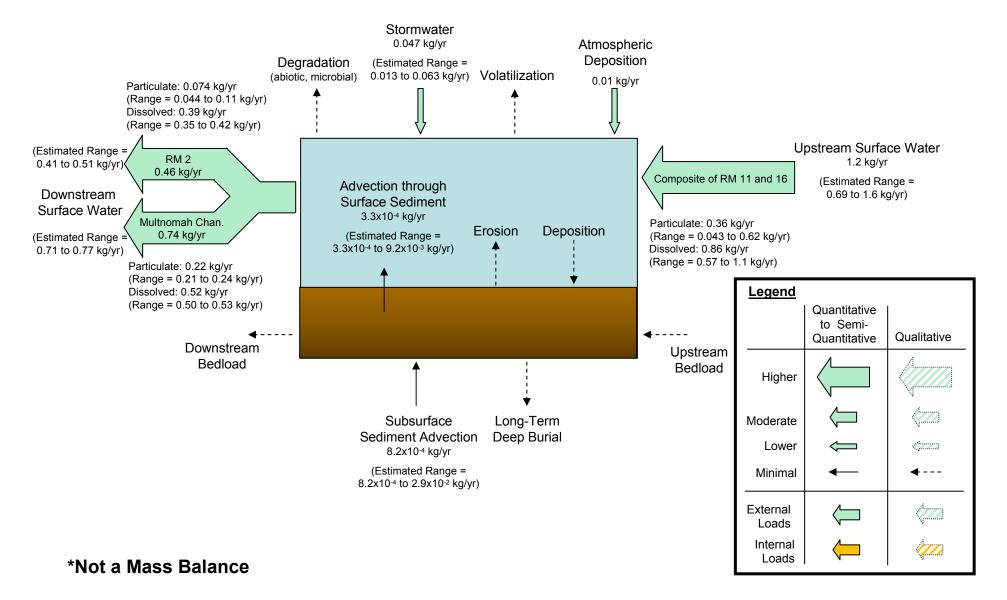
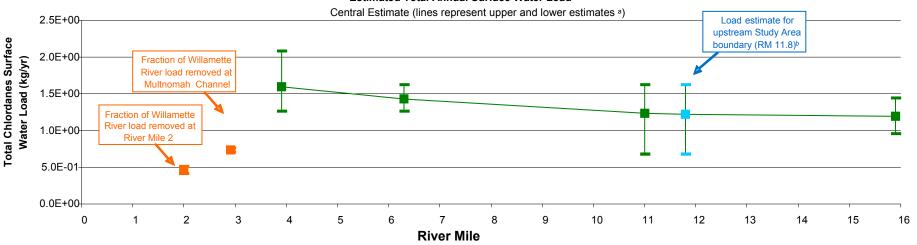


Figure 10.2-17
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Total Chlordanes – Study Area Annual Central Loading Estimate

Total Chlordanes

Estimated Total Annual Surface Water Load



Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimates^a)

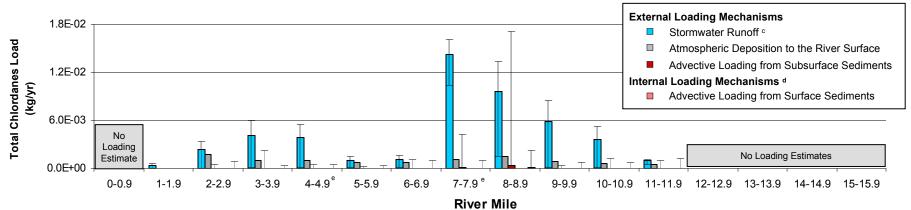


Figure 10.2-18
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Total Chlordanes

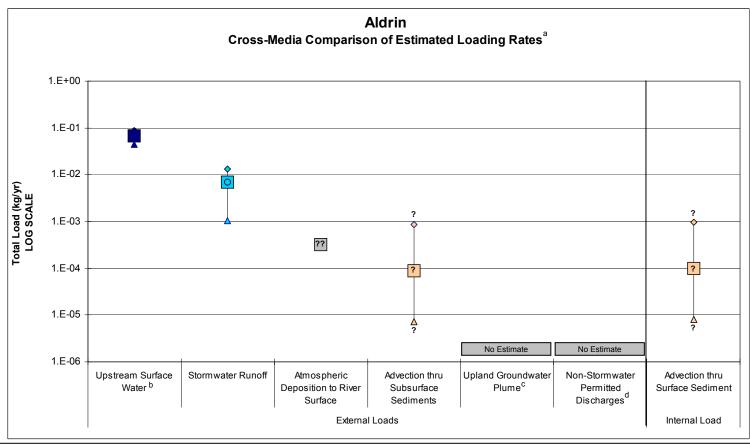
^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

^d Loading rates for internal mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^e Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).



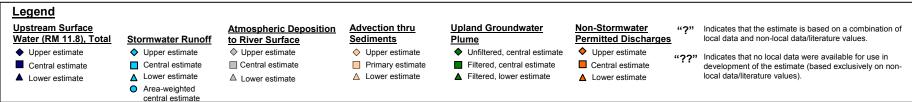


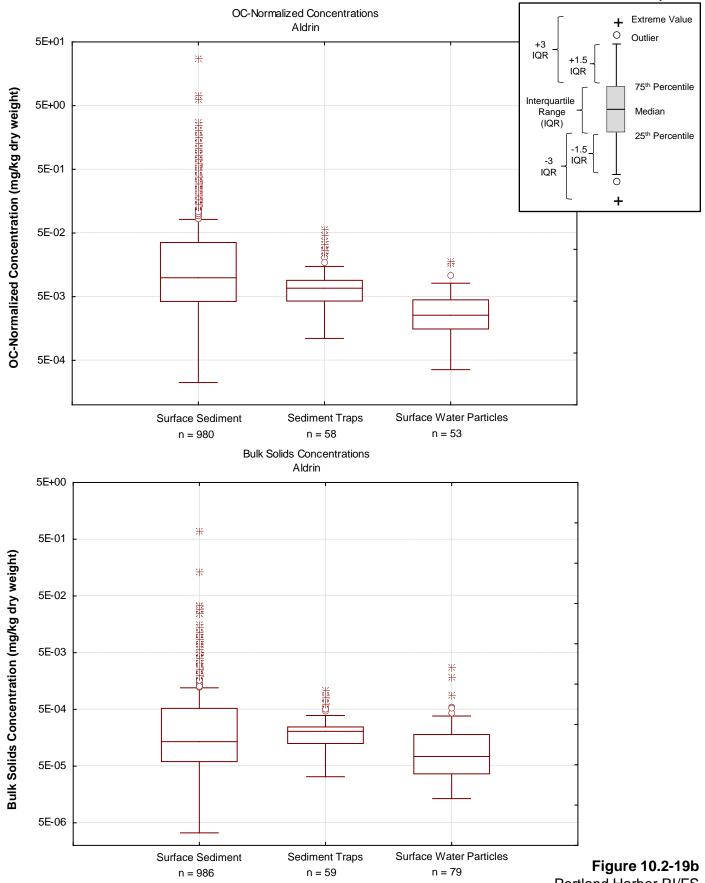
Figure 10.2-19a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Aldrin – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^d The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.



Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plots of Aldrin Bulk and
OC-Normalized Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

Aldrin*

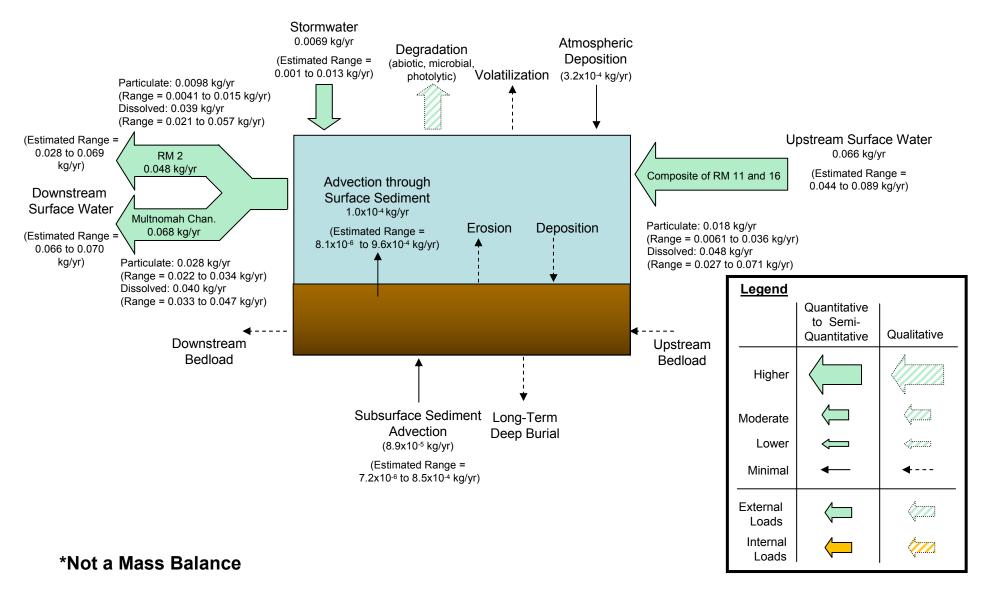
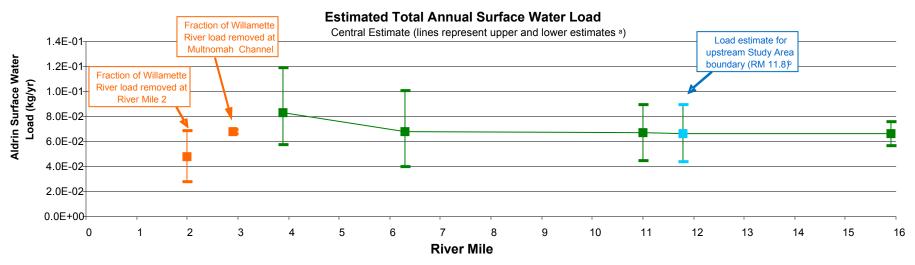


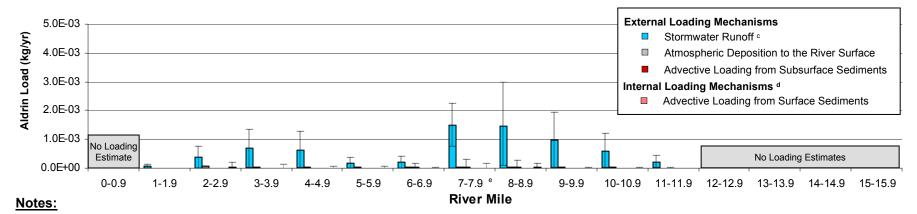
Figure 10.2-20
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Aldrin – Study Area Annual Central Loading Estimate

Aldrin



Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimatesa)



^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Figure 10.2-21
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Aldrin

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas. ^d Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^e Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

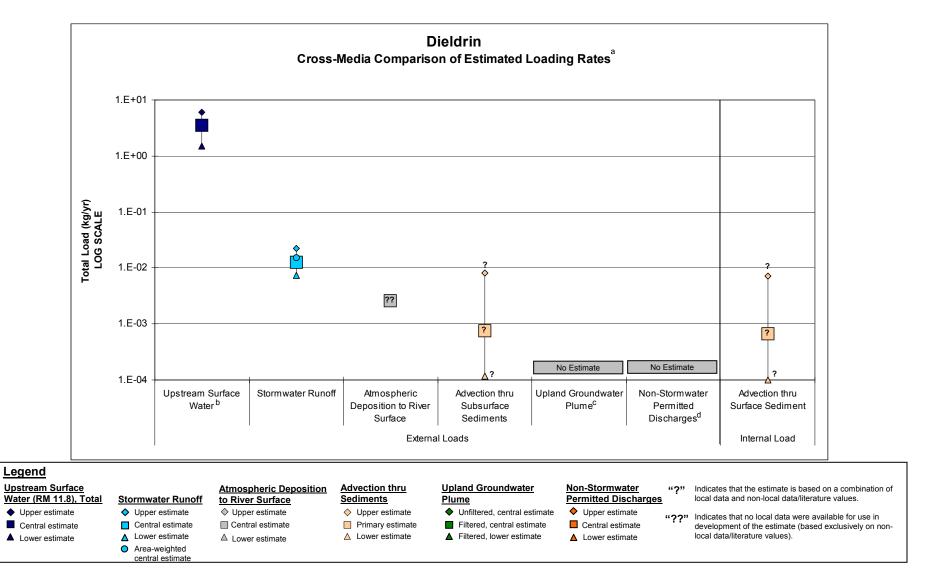


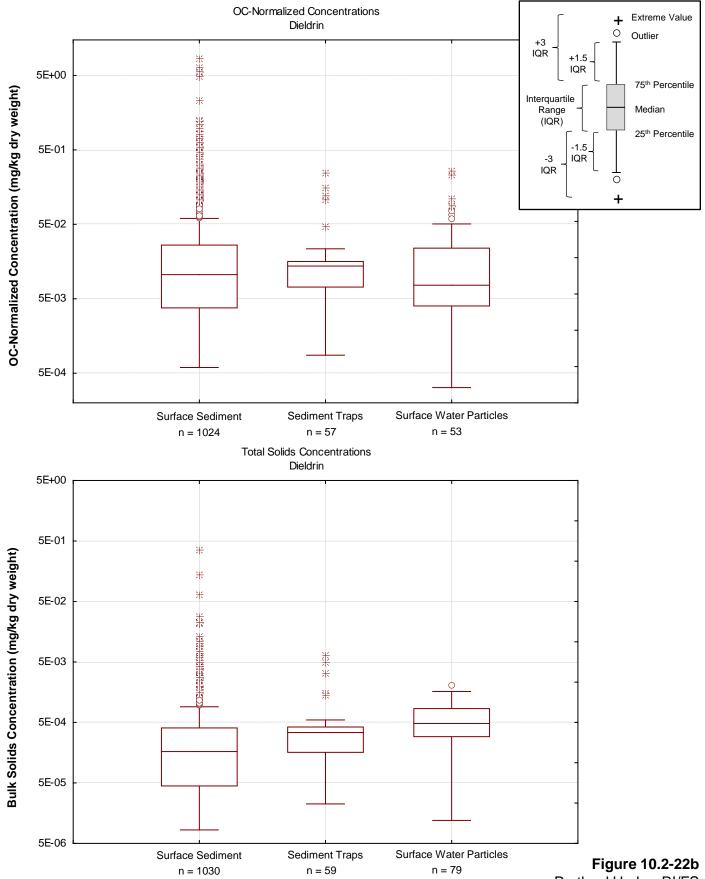
Figure 10.2-22a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Dieldrin – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^d The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.



Portland Harbor RI/FS Remedial Investigation Report Box-Whisker Plots of Dieldrin Bulk and OC-Normalized Sediment, Sediment Trap, and Particulate Surface Water Concentrations

Dieldrin*

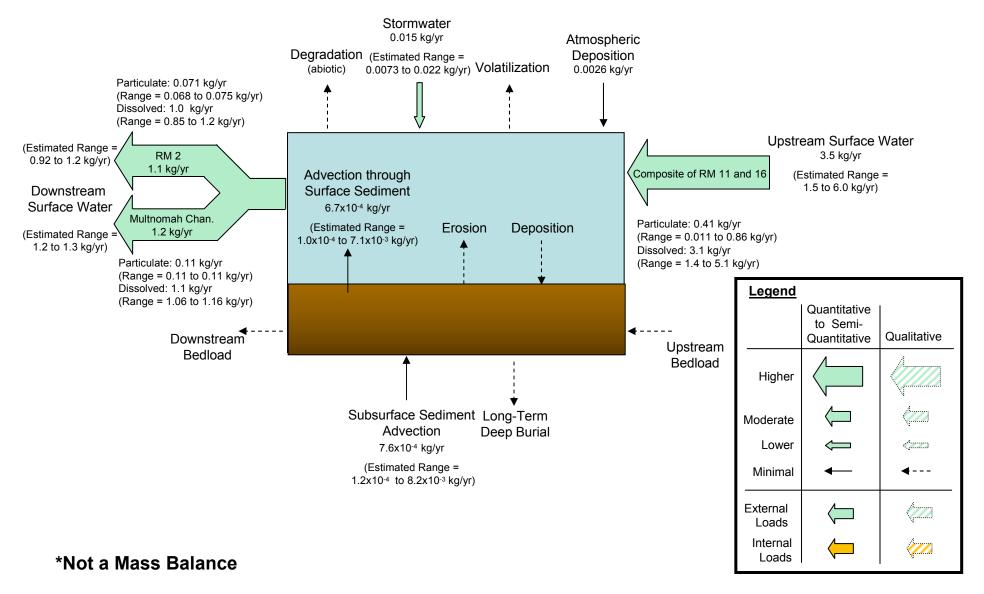
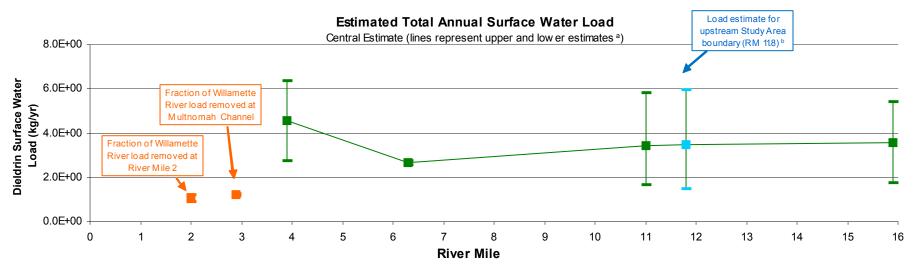


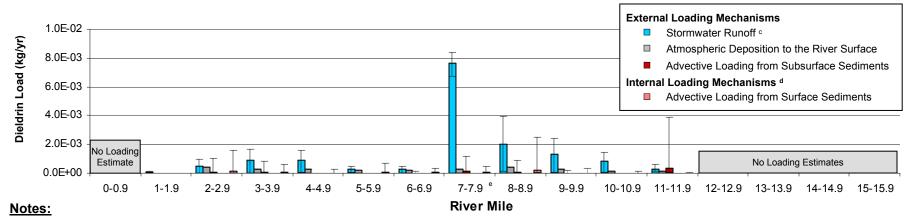
Figure 10.2-23
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Dieldrin – Study Area Annual Central Loading Estimate

Dieldrin



Cross-Media Loading Comparison by River Mile

Central Estimate (lines represent upper and low er estimatesa)



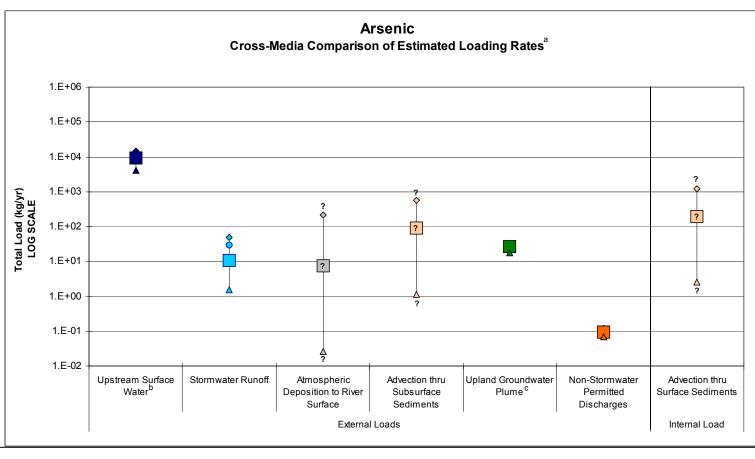
^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

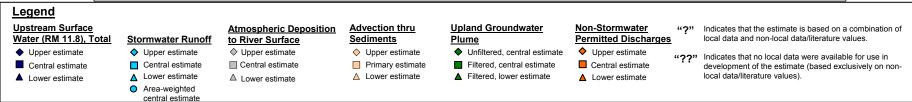
Figure 10.2-24
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Dieldrin

b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas. ^d Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^e Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

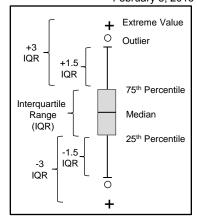


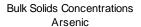


a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.





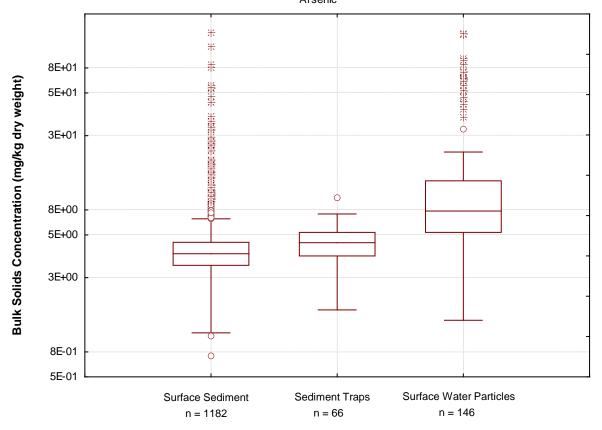


Figure 10.2-25b

Portland Harbor RI/FS

Remedial Investigation Report

Box-Whisker Plot of Arsenic

Bulk Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

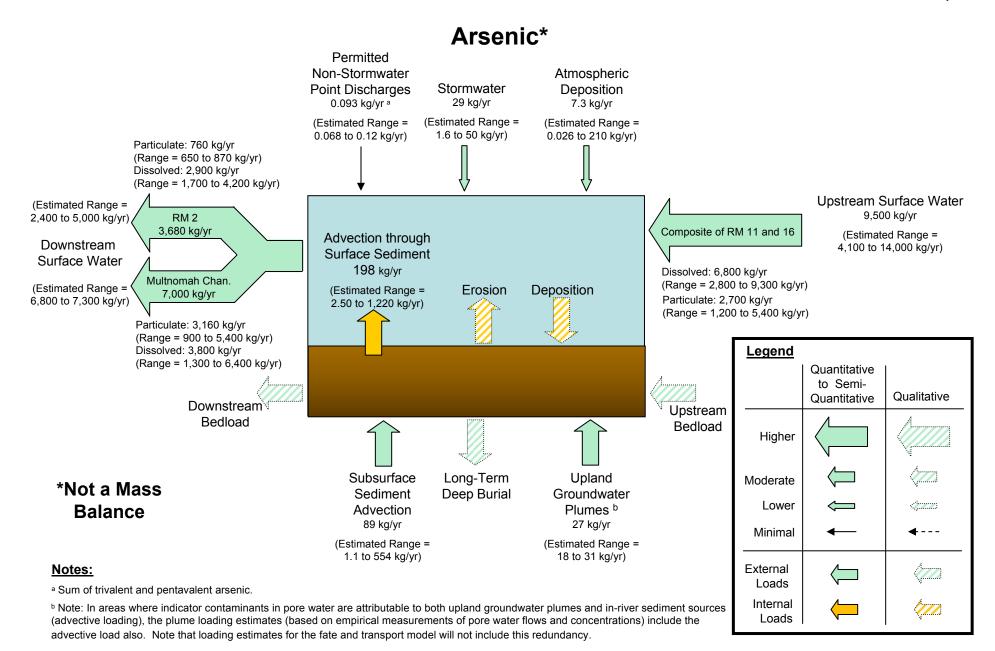
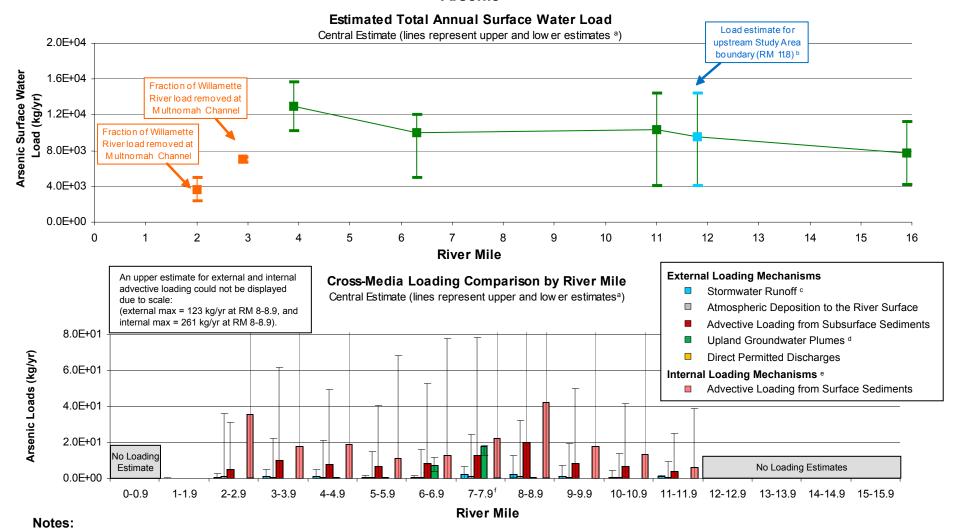


Figure 10.2-26
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Arsenic – Study Area Annual Central Loading Estimate

Arsenic



^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Arsenic

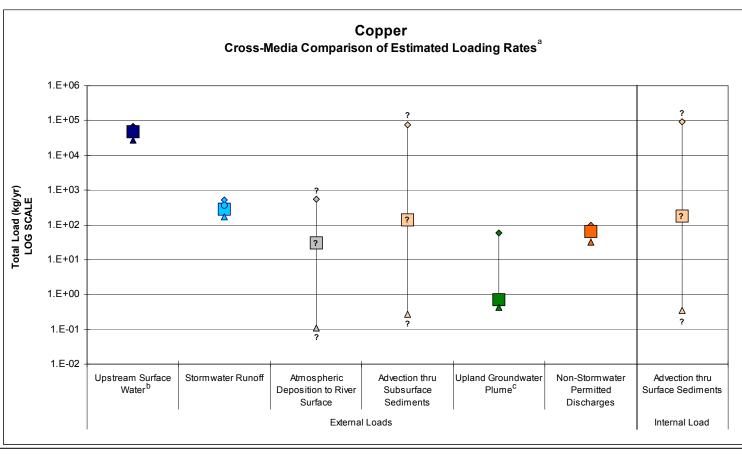
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

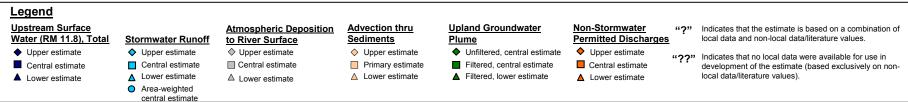
^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

^d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

e Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

f Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

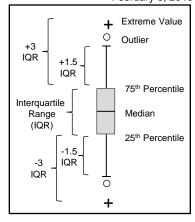


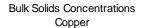


a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.





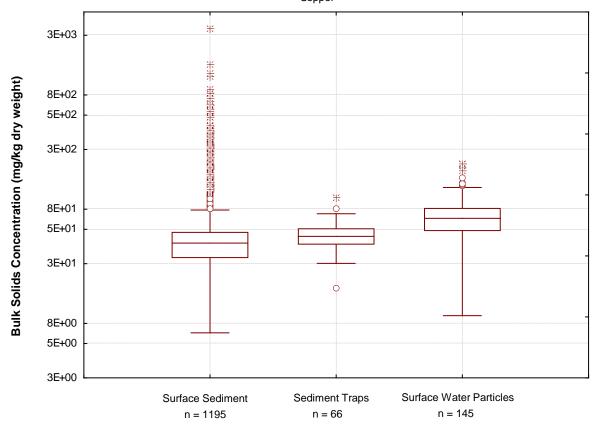


Figure 10.2-28b
Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plot of Copper
Bulk Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

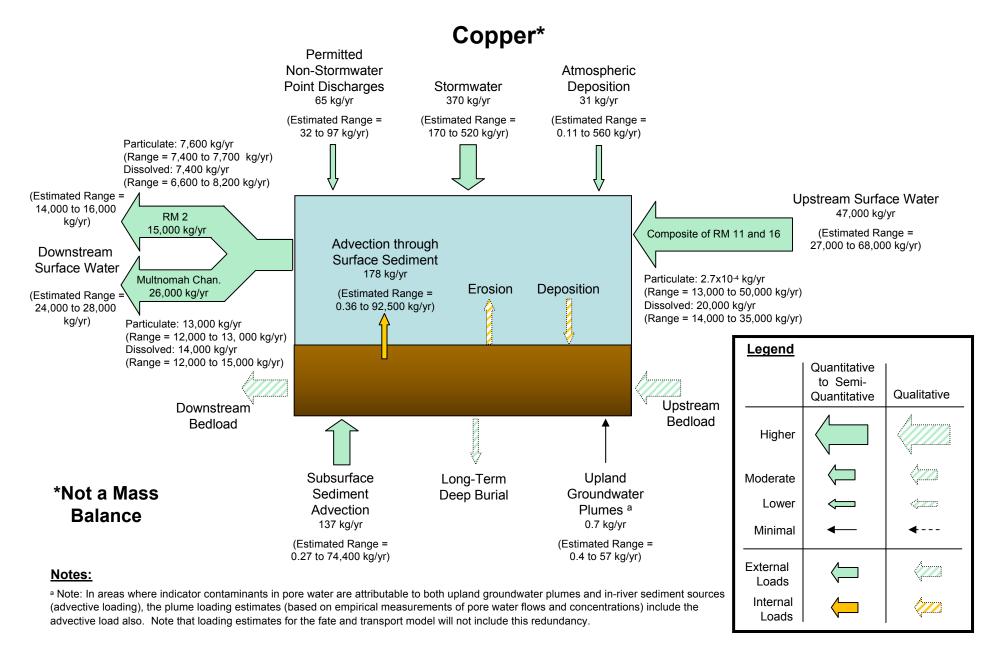
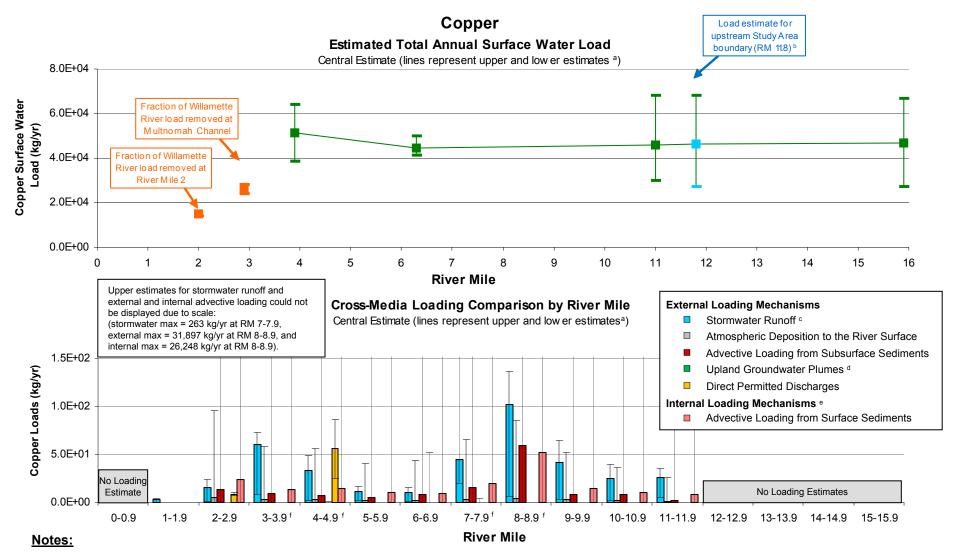


Figure 10.2-29
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Copper – Study Area Annual Central Loading Estimate



^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Figure 10.2-30
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Copper

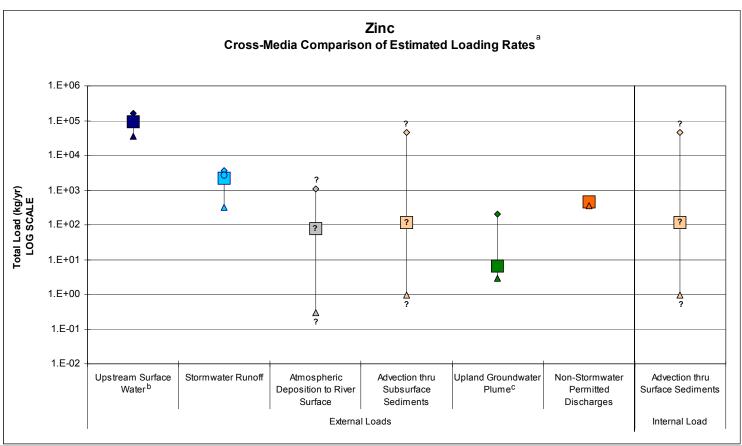
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

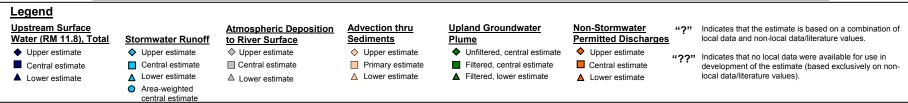
Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

^d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

^e Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results

^f Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

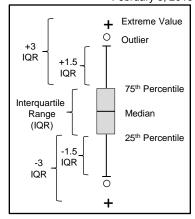


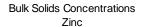


^a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.





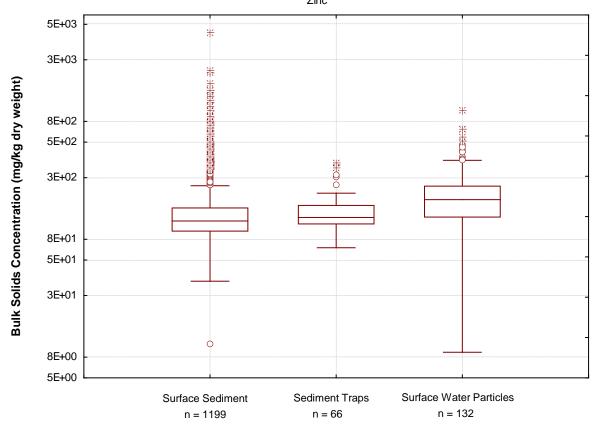


Figure 10.2-31b

Portland Harbor RI/FS

Remedial Investigation Report

Box-Whisker Plot of Zinc

Bulk Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

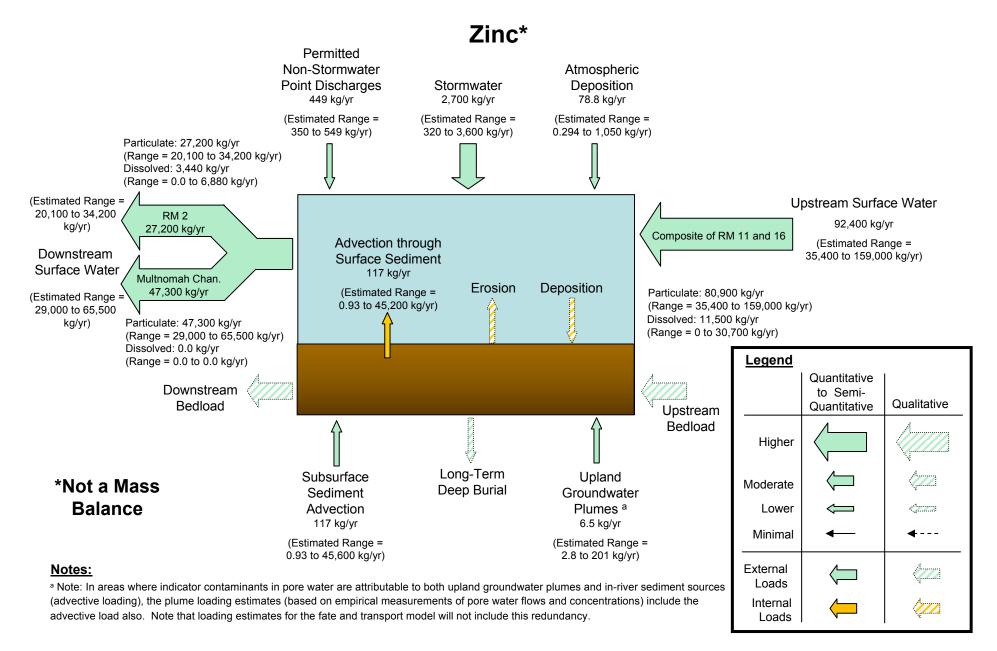
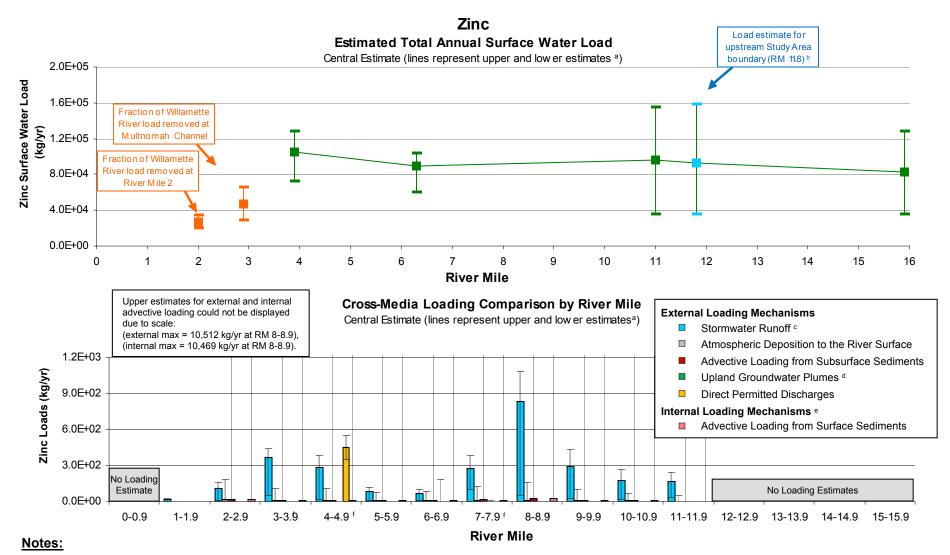


Figure 10.2-32
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Zinc – Study Area Annual Central Loading Estimate



^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Figure 10.2-33
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and
Loading Comparison by River Mile

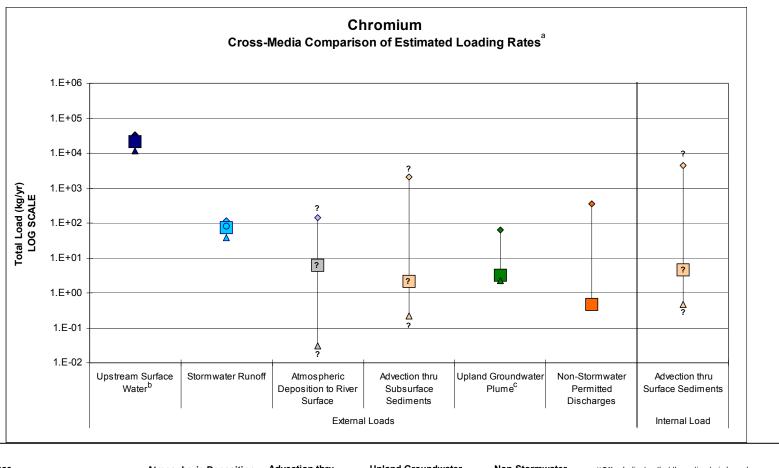
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

e Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^fLoad estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).



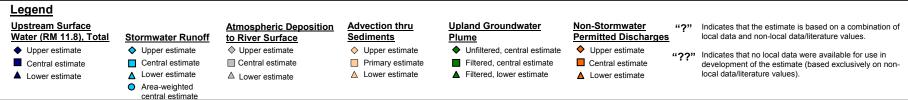
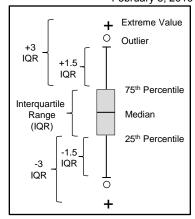


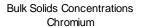
Figure 10.2-34a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Chromium – Estimated Total Annual Study Area Loads

^a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

c In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.





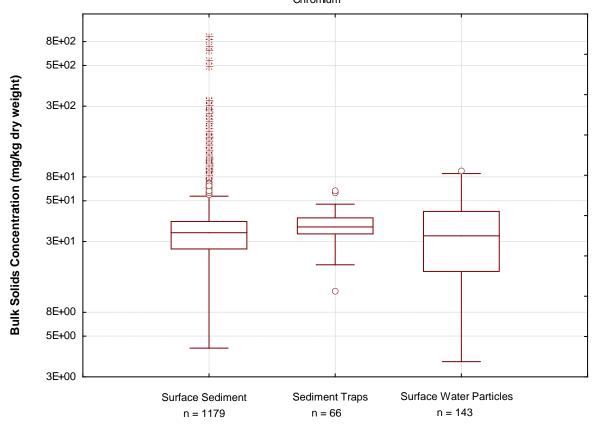


Figure 10.2-34b
Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plot of Chromium
Bulk Sediment, Sediment Trap,
and Particulate Surface Water Concentrations

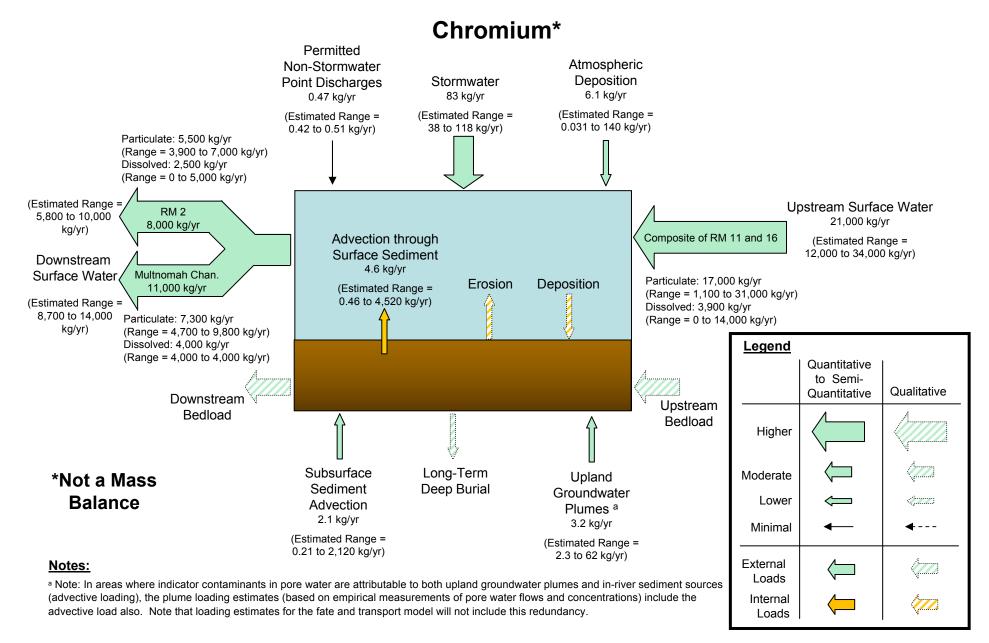
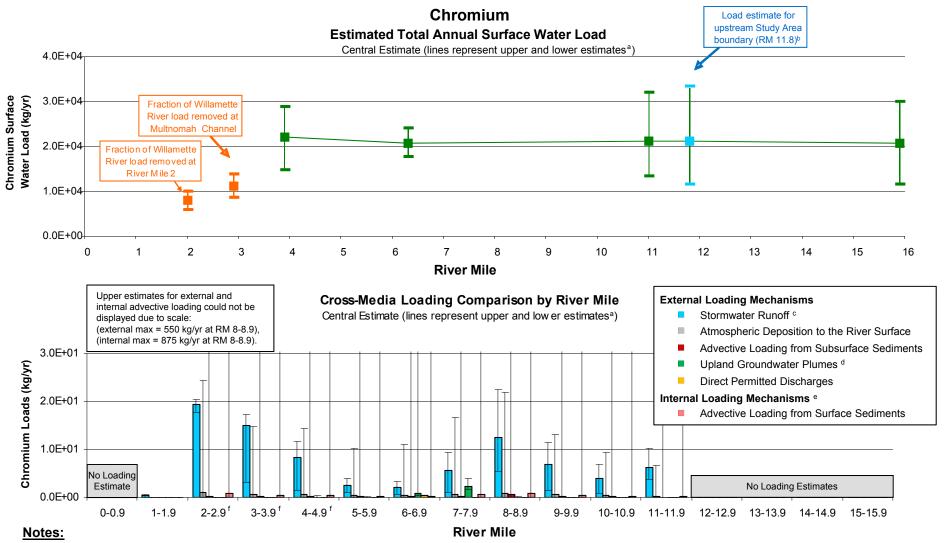


Figure 10.2-35
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Chromium – Study Area Annual Central Loading Estimate



^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

Figure 10.2-36
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Chromium

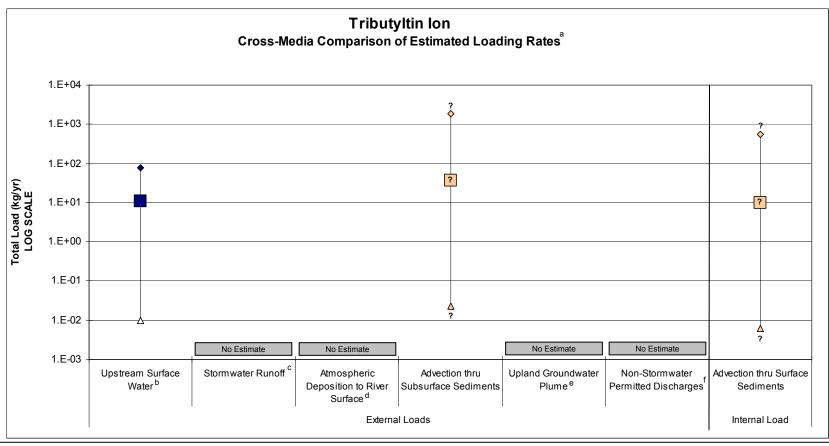
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

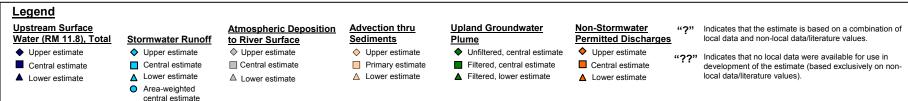
Stormwater estimates were generated for individual model cells rather than by river mile. Model cells frequently cross river mile boundaries; therefore, the river mile categories presented here are only approximations of stormwater runoff loading areas.

^d In areas where indicator contaminants in pore water are attributable to both upland groundwater plumes and in-river sediment sources (advective loading), the plume loading estimates (based on empirical measurements of pore water flows and concentrations) include the advective load also. Note that loading estimates for the fate and transport model will not include this redundancy.

^e Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

^f Load estimate includes one or more non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).





Hollow symbols indicate loads calculated with sample concentrations below the laboratory detection limit. These loads were estimated at 0 kg/yr.

Figure 10.2-37a
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Comparison
Tributyltin Ion – Estimated Total Annual Study Area Loads

a Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.

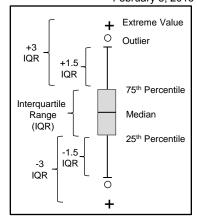
^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

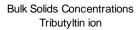
^c The chemical was not sampled in the LWG stormwater sampling program; therefore, no loading estimates could be generated.

^d No relevant atmospheric concentration data were found for this chemical; therefore, no loading estimates could be generated.

^e The chemical was not identified as a COI for upland groundwater plumes with a known or likely complete pathway to the river; therefore, it was not included in the analyte list for TZW sampling. Consequently, no loading estimates were generated for upland plume loading for this chemical.

^f The chemical was not included for sampling on discharge permits (included permits defined in Section 6.1.3); therefore, there were no data to support loading calculations.





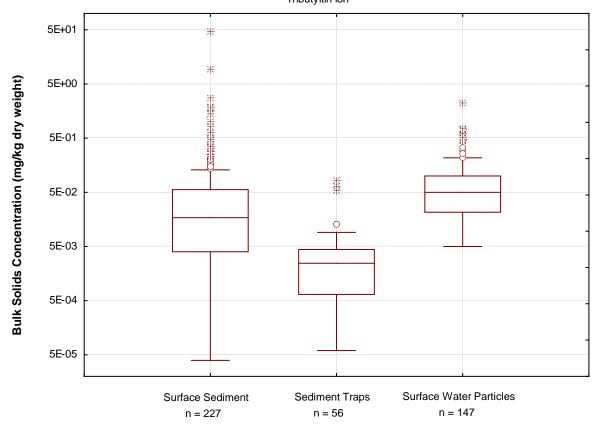


Figure 10.2-37b
Portland Harbor RI/FS
Remedial Investigation Report
Box-Whisker Plot of Tributyltin Ion

Box-Whisker Plot of Tributyltin Ion Bulk Sediment, Sediment Trap,

and Particulate Surface Water Concentrations

TributyItin Ion*

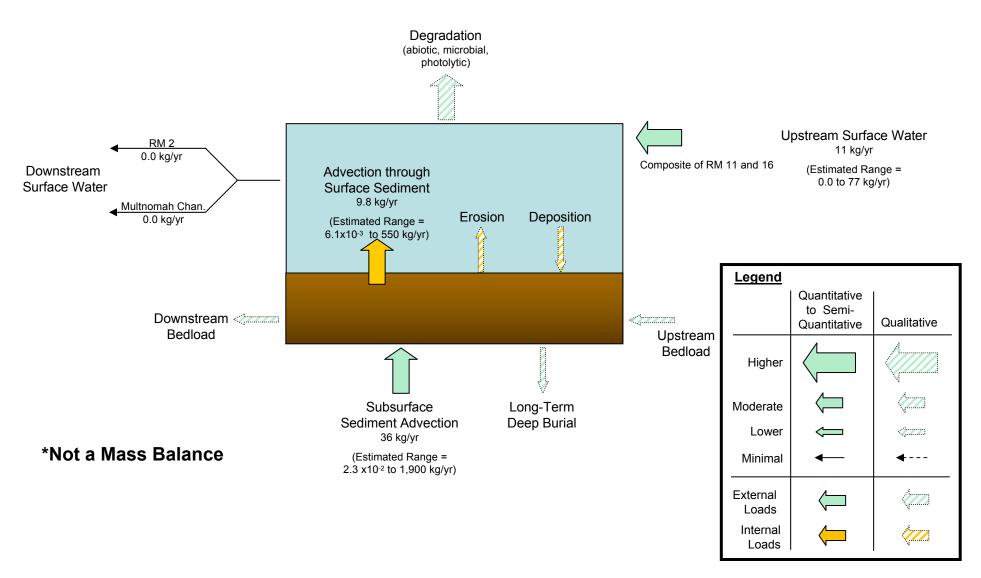


Figure 10.2-38
Portland Harbor RI/FS
Remedial Investigation Report
Cross-Media Loading Box-Arrow Diagrams
Tributyltin Ion – Study Area Annual Central Loading Estimate

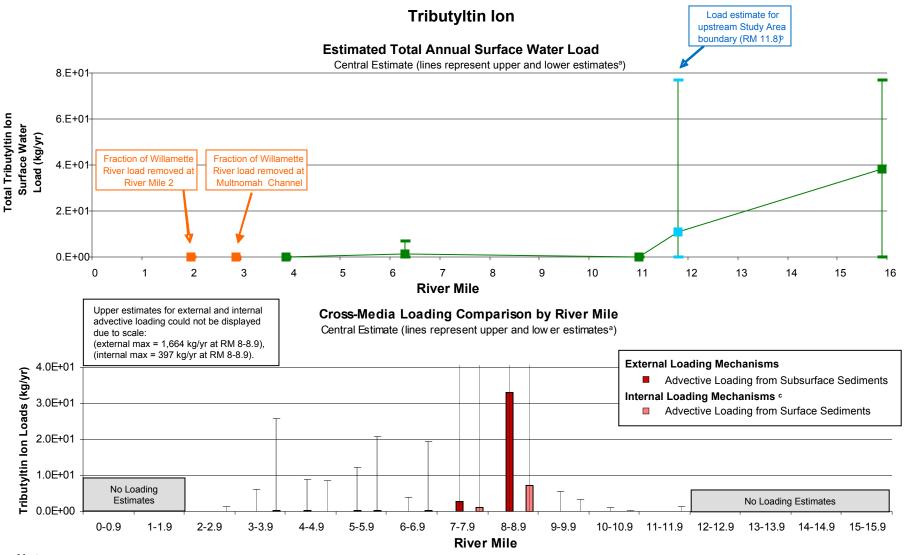


Figure 10.2-39
Portland Harbor RI/FS
Remedial Investigation Report
Surface Water Load and Loading Comparison by River Mile
Tributyltin Ion

^a Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

^b Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

^c Loading rates for internal loading mechanisms not shown on this figure, including erosion and long-term burial, will be developed from fate and transport model results.